Now Baker gives you Balanced Design in an all new 2000 lb. gas fork truck

This newest addition to Baker's outstanding line of gas-powered fork trucks now completes the range of models from 2000 to 7000 lbs. Like its companions it features Baker *Balanced Design*, with all elements coordinated to work together for top efficiency, maximum dependability and longest life.

For greatest operator convenience and safety it features absence of cowl and offset driver position for better visibility . . . recessed seat for lower driver silhouette . . . unobstructed access for mounting from either side . . . effortless automotive steer . . . self-adjusting, self-energizing and self-equalizing hydraulic brakes.

Actual turning radius of this sturdy compact truck is only 61½ inches . . . it operates in 57-inch intersecting aisles. Total lift 130 inches . . . lifting speed 45 FPM, lowering 65 FPM . . . travel speed 8 MPH forward, 7 MPH reverse —all with full load. Mast tilts 10° forward or back.

Baker®
industrial trucks

THE BAKER-RAULANG COMPANY
1251 WEST 80th STREET • CLEVELAND 2, OHIO
A Subsidiary of Otis Elevator Company

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'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Forced Warm Air Conference

ESTIMATING HEATING requirements, sizing ducts and the many other problems dealing with forced warm air will be discussed at a four-day conference. It will be conducted at Kellogg Center, Michigan State University, from March 25th through March 28th.

Such subjects as Evaporative Cooling; Fundamentals of Duct Resistance; Fans and Blowers; and Heat Loss and Heat Gain will be presented at this conference. In addition, they will have three classroom problems, considering many phases of heating and air conditioning.

Further information about the conference may be obtained by writing to Continuing Education Service, Michigan State University, East Lansing, Mich.

New Plant Engineers

William A. Snyder, mining and mechanical engineer, has been appointed plant engineer of Electro Refractories & Abrasives Corp., Buffalo, New York. He will be in charge of all design and new equipment engineering.

Robert D. Harrison will take over the duties of plant engineer at the Hutchinson, Minnesota, plant of Minnesota Mining & Manufacturing Co. He joined the company in 1950 as a production industrial engineer. He transferred to the adhesives and coatings division in 1951 and was made methods engineer supervisor of the company's Wayne, Michigan, plant in 1953. Prior to his present assignment, he was methods engineer in the company's St. Paul maintenance and machine shop.

Marine Corps Report on Teflon

VERSATILITY OF Teflon as a dry lubricant and preservative for metals has been demonstrated in Marine Corps tests of weapons coated with the material. A report of the tests has just been released to industry through the Office of Technical Services, U. S. Department of Commerce.

Teflon coatings were found to provide suitable protection for weapons in long-term storage despite a total lack of care. The films resisted absorption of any liquid, and adherence of ice, dust and dirt. Coated equipment was ready for use as it was removed from the packing.

Teflon's chemical and physical properties are described in the report along with detailed results of the tests. Techniques of application are contained in an appendix.

This interim report, the first on a projected series of tests, is PB 121286 Teflon, by C. A. Roberts, Marine Corps Development Center, price $1.25. It may be ordered from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C.

Designs of Wood Structures

NEARLY 300 designs of wood structures, ranging from basic types of trussed rafters and heavy wood roof trusses to highway structures, are listed in the new 1957 edition of "Typical Lumber Designs."

The designs listed cover the type of roof truss, dimensions as to span, depth and spacing, as well as live and dead loads.

This new edition has been condensed to a more convenient form for ready reference by designers and engineers. It is available from Timber Engineering Co., 1319—18th St., N.W., Washington, D. C.

Engineering Promotions At North American Aviation

H. W. Linton, plant engineer, has been promoted to facilities administrator for the Los Angeles Division of North American Aviation, Inc.

In his new job, he will be responsible for management of capital funds; assignment of areas involving inter-division considerations; matters involving the airport superintendent and Airport Commission; obtaining information on the facilities' problems of each functional division; representing division management in the solution of these problems; and submitting adequate facilities presentations to division and general office management and to functional division heads.

H. W. Linton

W. E. Fore

W. E. Fore, assistant plant engineer of the Los Angeles Division of North

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

To keep corrosion from "calling collect"—
Pacific Telephone & Telegraph Company used Wrought Iron Pipe

This radiant heating system, serving 22,500 square feet of floor area in Pacific Telephone & Telegraph Company's new warehouse at San Leandro, California, is an excellent example of the Company's insistence on durability. More than 16,300 feet of corrosion-resistant wrought iron pipe was used to safeguard the system against premature failure and costly repair.

The system, planned and designed by PT&T's Engineering Department, features some interesting construction details employed to protect the floor against damage from heavy fork-lift trucks and impact caused by bouncing reels of cable. After the 10-inch structural slab was poured, wrought iron pipe coils were laid in place. Over the pipe coils, a wire mesh was stretched to strengthen the concrete "topping" slab, and contribute to more even heat distribution. Then the pipe and mesh were covered with 3 inches of concrete. A metallic floor hardener was applied to the surface.

Architects for the project were Thomsen & Wilson, San Francisco. The system was designed by Harry S. Haley, San Francisco Consulting Engineer, in collaboration with Pacific Telephone & Telegraph Company engineers. The installation was made by Scott Co., Bay Area Mechanical Contractors.

Wrought iron pipe is ideally suited for this service because of its ease of installation, dependability in service. It takes short radius bends, without springback. It produces sound welds, free from pin-hole leaks. Its uniform structure assures sharp, full-depth threads. And because of its mechanical strength, wrought iron pipe withstands damage during installation. In service, wrought iron stays on the job longer, costs less per year.

Our bulletin, *Wrought Iron Pipe for Radiant Heating*, gives complete details, documents service records. Write for a copy.

A. M. Byers Company, Pittsburgh, Pa. Established 1864. Boston, New York, Philadelphia, Washington, Atlanta, Chicago, St. Louis, Houston, San Francisco. International Division: New York, N. Y.

Available throughout the world

BYERS *Wrought Iron Tubular and Hot Rolled Products*

ALSO ELECTRIC FURNACE QUALITY STEEL PRODUCTS

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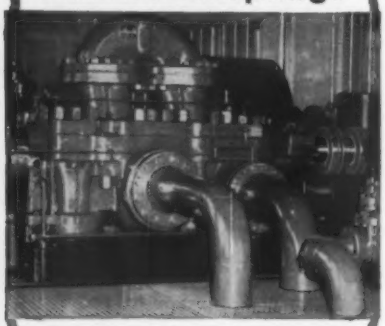
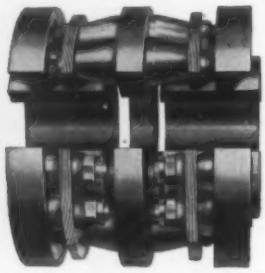
PROTECT YOUR PUMPS
with THOMAS Flexible Couplings



One Chemical Engineer reports he formerly spent 95% of his time supervising repacking of pump glands. Then he installed Thomas Flexible Couplings. Now his pumps need no attention.



Only THOMAS Flexible Couplings offer:

UNDER LOAD and MISALIGNMENT

1. No Cross-pull on Bearings or Gland.
2. No End-thrust on Bearings or Impeller.
3. Freedom from Backlash—Torsional Rigidity
4. Free End Float
5. Smooth Continuous Drive with Constant Rotational Velocity
6. Visual Inspection in Operation
7. Original Balance for Life—*and*

THOMAS ALL-METAL COUPLINGS HAVE NO WEARING PARTS SO THEY REQUIRE NO LUBRICATION AND NO MAINTENANCE

Write for Catalog 51A

THOMAS FLEXIBLE COUPLING CO.

WARREN, PENNSYLVANIA, U.S.A.

For more facts circle 504 on Reply Card

'ROUND ABOUT

American Aviation, Inc., has been promoted to plant engineer.

He started with the company 19 years ago in wing assembly. Working at night and studying in the daytime, he put himself through the University of Southern California and graduated with a degree in chemical engineering.

He has held a number of responsible positions, including foreman of the production control department and general foreman of the shipping department. He also organized the company's conservation department.

Mr. Fore and Mr. Linton are members of the Los Angeles Plant Engineers' Society, a chapter of the American Institute of Plant Engineers. Mr. Linton is past president of the Los Angeles Chapter.

New Works Engineer—New Plant

R. G. Edsall was appointed works engineer for the new Westinghouse switchgear distribution apparatus plant being constructed in Bloomington, Indiana. He will be located at the plant site when work begins and will be responsible for general supervision of construction.

He will continue as works engineer when the plant goes into production. He has been in works engineering since 1940 and is a veteran of 40 years of service with Westinghouse.

Construction Briefs Booklet No. 3 Now Available

READERS who have purchased reprint booklets of the Construction Briefs series will be interested to learn that the latest reprint, containing the Briefs from August 1955 to August 1956, is now available. Each of these reprints is priced at 50 cents.

And, for those who do not have the previous reprints, containing Briefs from July 1953 to May 1954 (Booklet 1), and from July 1954 to May 1955 (Booklet 2), these are again available, after having been completely sold out.

New Appointment at U.S. Steel

Justin E. Foldessy has been appointed assistant chief engineer of special construction at U. S. Steel Corporation's Gary Steel Works.

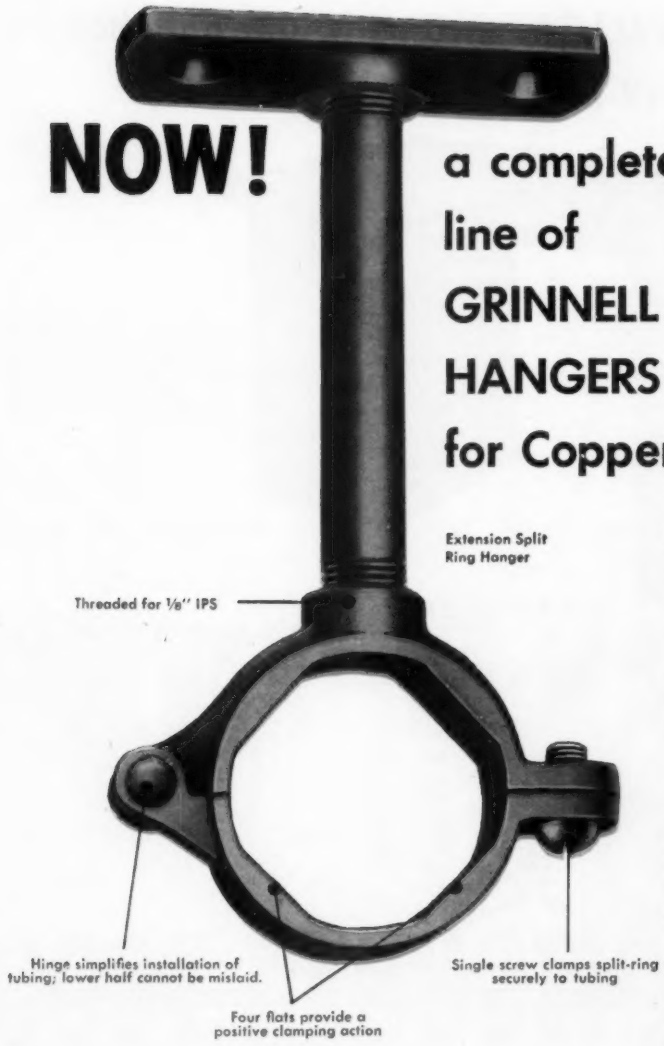
He is a native of Cleveland, Ohio, and was graduated from Purdue University with a B.S. degree in Electrical Engineering. He engaged in graduate work in both mechanical and metallurgical engineering at Carnegie Tech in Pittsburgh.

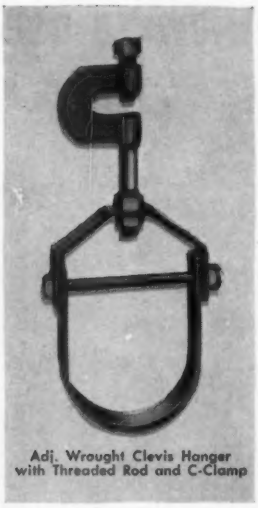
He began his service with U. S. Steel Corp. in 1934, working in various eastern plants of the company until his present appointment.

Dick Morris Relates Russian Experiences at SBME Meeting

Dick Morris, past president of the American Institute of Plant Engineers and retiring president of the Society of Business Magazine Editors, tells editors about some of his experiences in Russia. At his left is H. E. Green of Printer's Ink and president of the National Conference. At his right, in order, are Bill Phair, editor of Hardware Age, new SBME president; Jim Crowe, editor of Industrial and Engineering Chemistry, and member of the SBME Executive Committee; and Paul Wooton, Chairman of the Executive Committee. Other new officers of the SBME also present include: Charles O. Herb, editor, Machinery, first vice-president; Colin Carmichael, editor, Machine Design, second vice-president; and Frank Richter, editor, Modern Railroads, secretary-treasurer

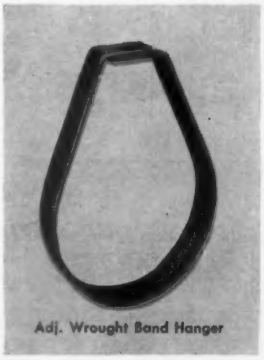
NOW! a complete line of GRINNELL HANGERS for Copper Tubing


Extension Split Ring Hanger
Threaded for ⅛" IPS
Hinge simplifies installation of tubing; lower half cannot be mislaid.
Single screw clamps split-ring securely to tubing
Four flats provide a positive clamping action


Adj. Wrought Clevis Hanger with Threaded Rod and C-Clamp

Adj. Wrought Ring Hanger

Split-Ring with Socket and Coach Screw


Adj. Wrought Band Hanger

Grinnell now offers, in one *complete* line, every standard type of hanger and support for copper tubing. All are heavily copper plated for long, rugged wear. All are accurately sized to fit standard copper tubing, and designed to give a neater installation wherever copper tubing is used.

For dependability, speed, and convenience . . . let Grinnell's coast-to-coast network of warehouses and jobbers serve you as a one-stop source for all your copper tubing hanger requirements. Grinnell-trained personnel are ready to work with you "on-the-job", anywhere, to help solve any problem connected with hangers and supports for copper tubing.

Whether it be for copper tubing or standard pipe, specify Grinnell hangers. No other company makes as complete a line; provides as thorough a distribution service; or can cooperate as fully on *all* your piping assignments.

Write for your copy of the COPPER TUBING HANGER Catalog. Grinnell Company, Inc. 222 West Exchange St. Providence, Rhode Island.

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AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPORTS

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

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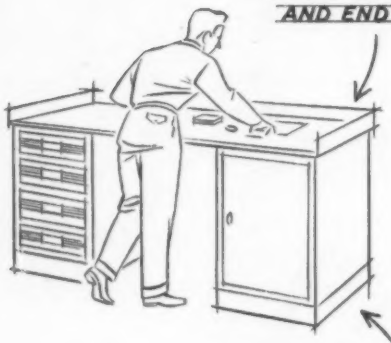
HOW TO USE STANDARD HALLOWELL UNIT WORK BENCHES AND ACCESSORIES IN PLANT MODERNIZATION

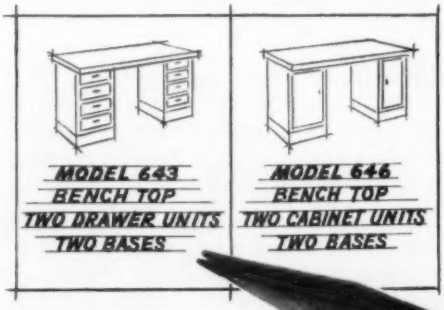
MODEL 640 - BENCH TOP, DRAWER UNIT, CABINET UNIT, TWO BASES

ASSEMBLE THEM IN CONTINUOUS LINE - JOINED IN THE MIDDLE OF THE UNITS OR BUTTED END-TO-END



USE THEM AS INDIVIDUAL BENCHES

4 TOP MATERIALS, 2 LENGTHS, 2 WIDTHS
2 HEIGHTS - ALL STANDARD



MODEL 643
BENCH TOP
TWO DRAWER UNITS
TWO BASES

MODEL 646
BENCH TOP
TWO CABINET UNITS
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HALLOWELL SHOP EQUIPMENT DIVISION
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BENCHES (CABINET, WORK, UNIT) • STOOLS AND CHAIRS • SHOP DESKS • TOOL STANDS AND CABINETS • DRAWERS, DRAWER TIERS • STEEL CARTS • SHELVING

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THINK

about these five big factors of

PREVENTIVE MAINTENANCE

to crash barriers in

COST REDUCTION and OUTPUT

YOU CAN BE SURE...IF IT'S

Westinghouse

J-95175-1

R. L. Kirkpatrick* presents
a fresh approach to
industry's primary problem . . .

Five reasons why Westinghouse Preventive Maintenance is your greatest opportunity for improved plant efficiency

Improved production continuity . . . minimum maintenance costs . . . lower taxes . . . reduced insurance rates . . . and greater safety for personnel — these are the elusive goals of plant management everywhere. Westinghouse Preventive Maintenance will help you achieve these management objectives simply, efficiently. Here's why:

1. Greater Production Continuity

High machine availability through Westinghouse Preventive Maintenance means more output per unit . . . smoother, more dependable production flow. Scrap losses, production delays and order cancellations are minimized. Reducing down time in mechanized systems avoids critical production losses that strangle other production operations, ultimately affect marketing effort. Fewer breakdowns and outages provide more time and dollars for new installations, expansion programs and other plans.

2. Minimum Maintenance Costs

Westinghouse Preventive Maintenance eliminates costly post-mortem expenses such as premium rates for parts and service, poor quality workmanship, repetitive failures and repairs. Standardized methods lead to uniform parts and materials, reduce overtime for electrical and mechanical maintenance work. Parts last longer; spare stocks can be predetermined easily; inventories reduced. Costs are more accurately measured.

3. Lower Taxes

You help determine your own tax status through money spent in upkeep and improvement, and by money received for sales or trade-ins of machinery and equipment. It's to your advantage to get optimum equipment use through preventive maintenance because repairs are tax deductible, replacements are capitalized. Greater face value of new equipment boosts state property taxes, where applicable. A Westinghouse Preventive Maintenance program permits you to better account for repair activities for tax purposes.

*MANAGER, MAINTENANCE SALES DEPARTMENT, WESTINGHOUSE ELECTRIC CORPORATION

YOU CAN BE SURE... IF IT'S

4. Reduced Insurance Rates

Alert management has found it extremely wise to protect business operations with sufficient, well-chosen insurance coverage. If the assured has good loss experience, coupled with favorable plant conditions and practices, premiums are less. Westinghouse Preventive Maintenance helps you protect your ability to stay in business at minimum cost . . . whether you obtain coverage through fire and personnel insurance, or with business interruption insurance.

5. Greater Safety

Proper maintenance means a safer plant with fewer accident claims. Result is improved employee morale and labor-management relations, availability of more productive man-hours. A "just-make-things-do" attitude on electrical and mechanical accident prevention invites fire and other mishaps. Working at safety through Westinghouse Preventive Maintenance makes your plant a more desirable workplace, reduces cost of health and accident insurance coverage.

How the Complete Westinghouse Maintenance Service Will Help You

Westinghouse has the men, materials and techniques to assist you in making your preventive maintenance program work. Repair facilities, advanced methods, engineering talent and ample parts supplies will enable you to overcome pressing maintenance problems, and get all benefits from preventive maintenance in the five vital areas confronting business management today.

Yet, don't forget this important aspect

→

Westinghouse

J-95175-2

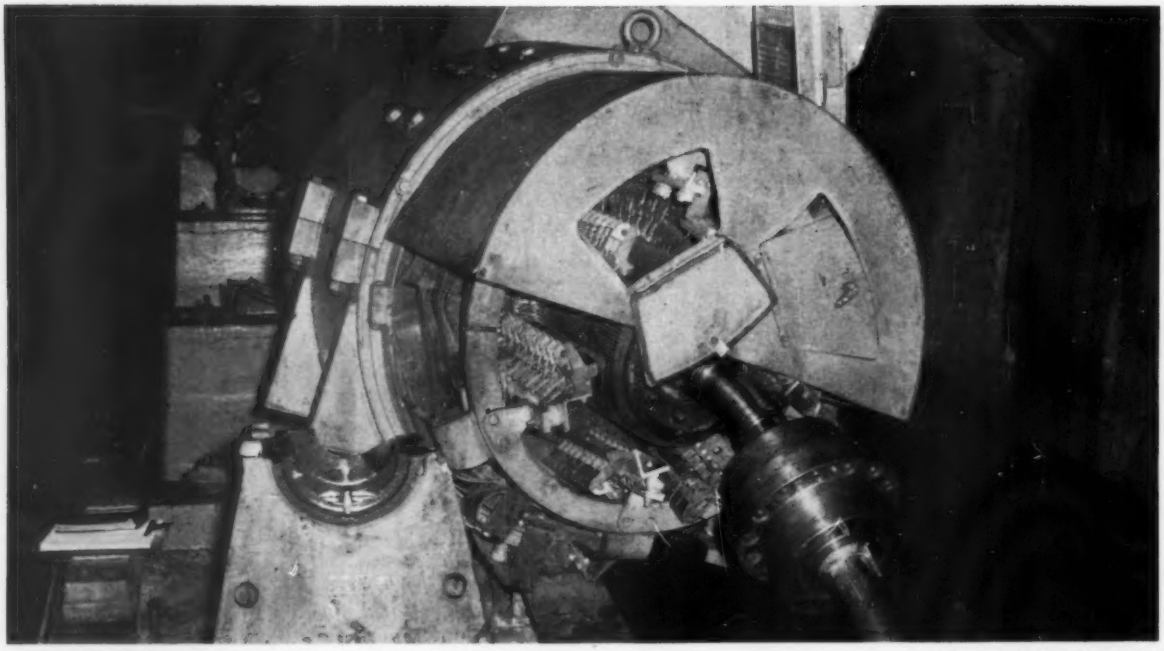

Photo courtesy The Hartford Steam Boiler Inspection and Insurance Co.

IF FAILURES OCCUR:

Here's how Westinghouse emergency maintenance service speeds your plant recovery

You broaden repair facilities without investment or upkeep by using Westinghouse repair plants. Here the newest techniques are applied to all repair jobs by skilled Westinghouse craftsmen.

Unscheduled stoppages caused by equipment breakdowns, and disasters such as floods, hurricanes, fires and explosions occur in spite of the best preventive maintenance program. If they do affect you, remember that Westinghouse is ready when and where needed to help get your stricken equipment back in operation — quickly.

Facilities of 38 Westinghouse repair plants, carefully located across the nation, are available around the clock, seven days a week, to help you bounce back after disaster.

Specially trained engineering man power is available for inspection, repair and maintenance work right on your property. Provided with special mobile equipment, they can readily augment your regular forces in time of special need, or handle repairs of large equipment that cannot be readily or easily moved.

Thirty-four Westinghouse renewal parts warehouses, backed by nationwide Westinghouse original product manufacturing facilities, establish a prompt supply source for broad parts selection. Special Westinghouse manufacturing plants at 42 locations will make parts to order.

Call the nearest Westinghouse sales office for your planned or emergency maintenance service or repairs . . . part of the *complete* Westinghouse maintenance service. Ask your Westinghouse salesman for a presentation of *The Economies of Electrical Apparatus Repair* . . . or write Westinghouse Electric Corporation, 3 Gateway Center, P.O. Box 868, Pittsburgh 30, Pa.

J-95175-3

YOU CAN BE SURE... IF IT'S Westinghouse

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EXON 468...the easy way to make FLOORING finer...and faster!

Typical of the Pin-Pointed Properties in Exon vinyl resins

Specifically made for flooring, Exon 468 vinyl resin is another dramatic demonstration of the unusual benefits to all industries in the "Pin-Pointed Properties" of Firestone Exon resins.

Exon 468 has been specifically formulated for makers of vinyl asbestos floor tile. Substantial production savings make it the wise choice . . . with its higher bulking density, it increases mixer output 10 to 25%. Processing is easier, since Exon 468 is engineered to permit rapid fusion.

Compounds made of Exon 468 are less affected by heat and light. They hold pigmentation and stabilizing ingredients exceptionally well.

Let Firestone engineers pin-point resin properties to solve your specific needs. Call or write today:

Firestone
EXON
RESINS

CHEMICAL SALES DIVISION

FIRESTONE PLASTICS CO., DEPT 715D, POTTSTOWN PA. • A DIVISION OF THE FIRESTONE TIRE & RUBBER CO.

INDUSTRY'S MOST COMPLETE LINE OF VINYLS ENGINEERED TO YOUR SPECIFIC NEEDS

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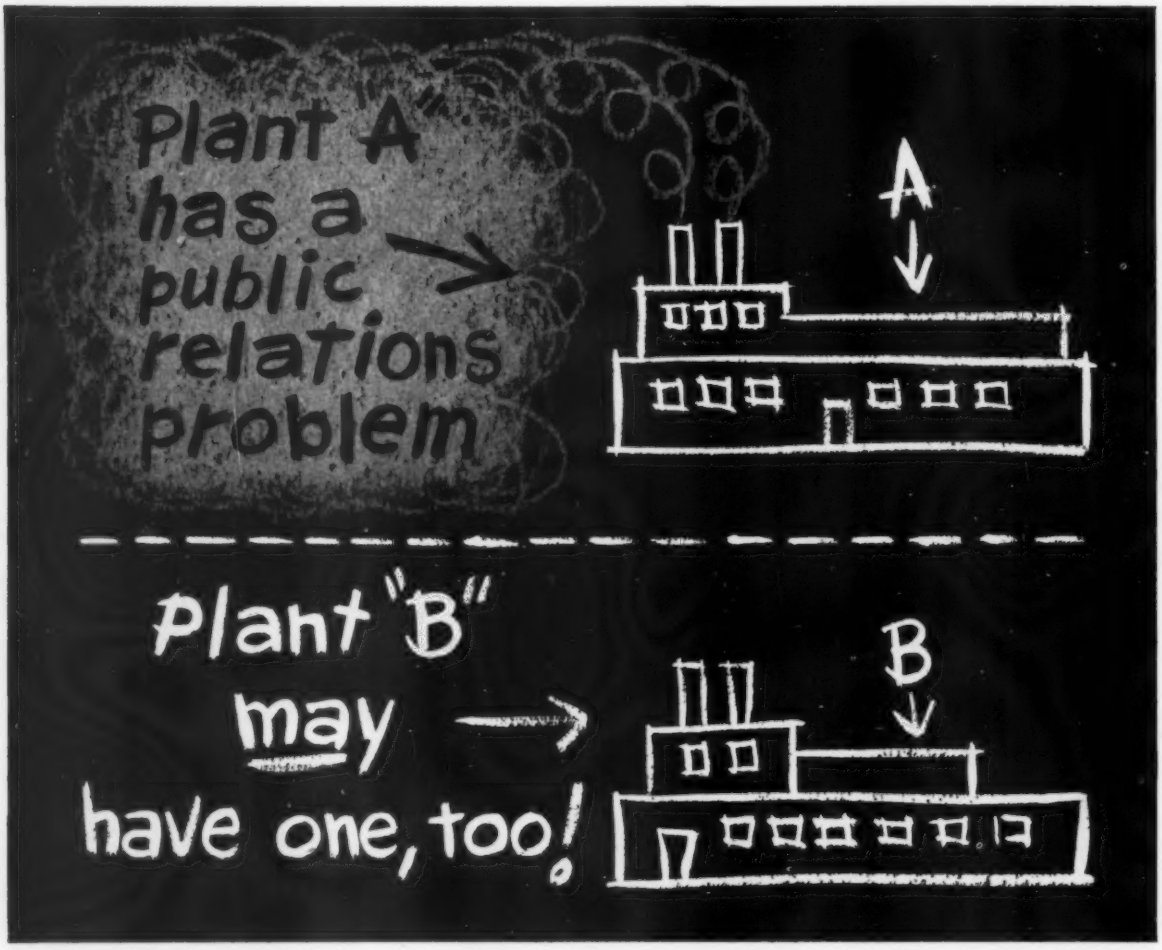

Is your plant producing an invisible public NUISANCE?

The unwanted by-products of plating tanks, salt bath furnaces, metalworking machines and boilers —mists, salts, metal dust and fly ash—often can't be seen. But they can silently and swiftly do their destructive work on plant roofs, automobile finishes and home exteriors. Result: high maintenance costs, unhappy employee and neighborhood relations.

The answer to both invisible and visible air pollution is AAF dust control. AAF is *completely equipped* for the fight, engineers a line of dust control units that includes dynamic precipitators, hydrostatic precipitators, dry centrifugals and fabric arresters.

Ask your local AAF representative to check sources for *all* air pollution—both the seen and the unseen. Call him now or write us direct.

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Dust Control Equipment

Air Filters and Precipitators

Illinois Heating Specialties

American Air Filter
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228 Central Avenue, Louisville 8, Kentucky
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— BETTER AIR IS OUR BUSINESS —

Herman Nelson Unit Heaters

Herman Nelson Portable Heaters

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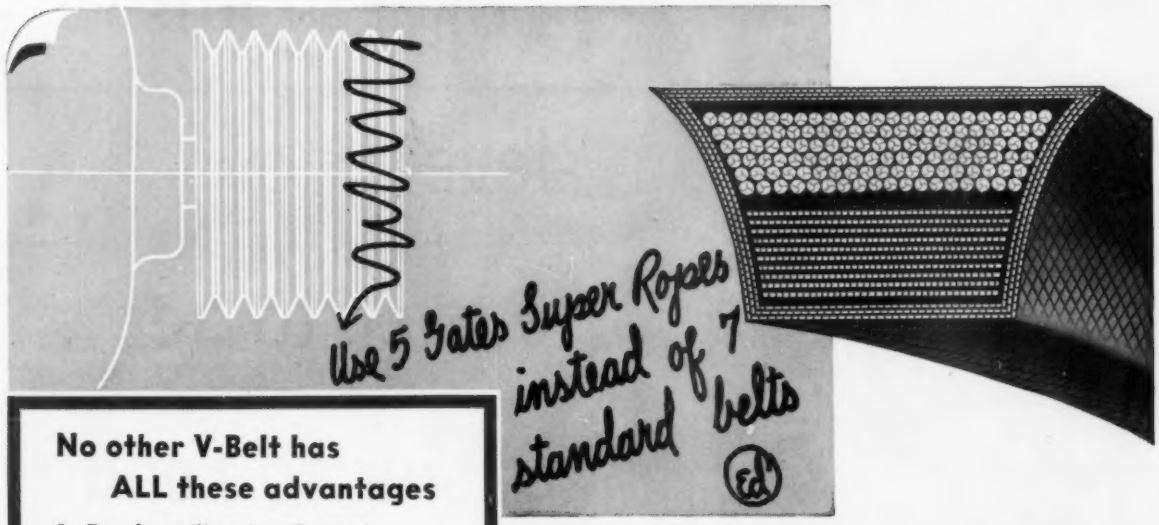
Get more HP delivered per $ of drive cost

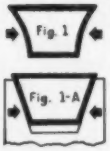


No other V-Belt has ALL these advantages

1. Tough, resilient Tensile Cords

Super-strength tensile cords provide 40% greater horsepower capacity . . . easily absorb heavy shock loads . . . reduce number of belts required . . . save weight and space.

2. Concave Sidewalls (U.S. Pat. 1813698)



Concave sides (Fig. 1) increase belt life. As belt bends, concave sidewalls become straight, making uniform contact with sheave groove (Fig. 1-A). Uniform contact means less wear on sides of belt . . . far longer belt life.

3. Flex-Weave Cover (U.S. Pat. 2519590)

A Gates exclusive provides greater flexibility with far less stress on fabric. Cover wears longer . . . increases belt life . . . more power available to driven machine.

4. High Electrical Conductivity

Built into Gates Super Vulco Ropes for safer drives (in explosive atmospheres).

5. Oil, Heat, Weather Resistant

Special rubber compounds make Super Vulco Ropes highly resistant to heat, oil, and prolonged exposure.

Cut sheave width and weight with Gates Super Vulco Ropes

You save on cost of iron . . . you reduce bearing width and support . . . you save space and overall cost . . . when you design a drive using Gates Super Vulco Ropes. Here's why:

5 Gates Super Vulco Ropes do the work of 7 standard V-belts

That's because Gates Super V-Belt has 40% more horsepower capacity than standard belts. Therefore, you can reduce sheave width and weight . . . cut cost.

A wealth of drive data is quickly available to you. Simply call your nearby Gates V-Belt Distributor (see 'phone book yellow pages) for a Gates V-Belt specialist. Stocks available in industrial centers around the world. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

The Mark of Gates Specialized Research

TPA 91 A

Gates Super VULCO ROPE Drives

For more facts circle 510 on Reply Card

boiler water levels now easier to **see**... easier to **read**

Whatever the boiler pressure, high or low, YARWAY Remote Indicators give accurate, instant, eye level boiler water level readings at any convenient plant location.

Boiler Code Case No. 1155* says in part, "... two independent remote level indicators of the compensated manometric type may be used instead of one of two required gage glasses for boiler drum water level indication in the case of power boilers with all drum safety valves set at or above 900 psi..."

YARWAY Remote Liquid Level Indicators fill the bill—and feature a "wide vision" face that makes reading easier from any angle.

Accurate—because indicator is actuated by the boiler water itself—by the pressure differential between a constant head and the varying head of water in the boiler drum.

Also use YARWAY Remote Indicators on heaters of various types.

For full description, write for YARWAY Bulletin WG-1824.

*Write for free reprint of case description.

Yarway Remote Hi-Lo Alarm Signals—lights or horns—can be used with Yarway Remote Liquid Level Indicator and placed at any location in the plant.

YARNALL-WARING COMPANY

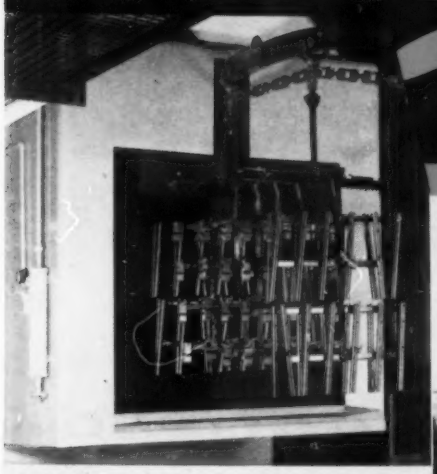
145 Mermaid Avenue, Philadelphia 18, Penna.
BRANCH OFFICES IN PRINCIPAL CITIES

YARWAY REMOTE LIQUID LEVEL INDICATORS

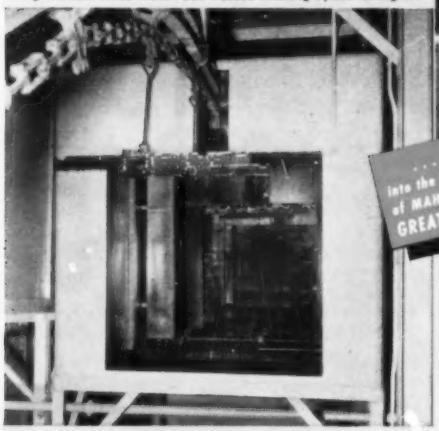
For more facts circle 511 on Reply Card

COMPLETE *Finishing* SYSTEMS

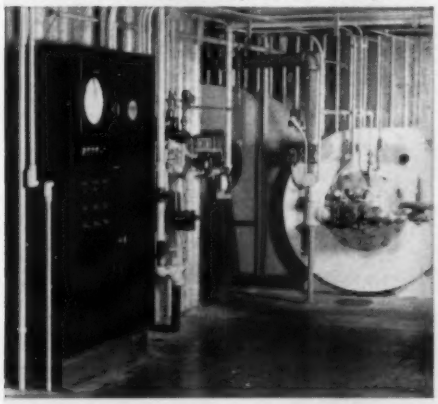
. . . for ENAMELS • LACQUER • PAINT • VARNISH



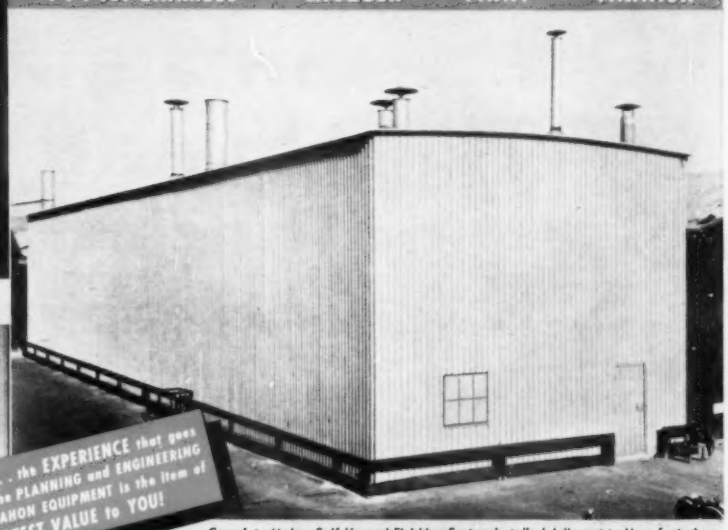
Truck Parts Entering Five-Stage Metal Cleaning and Rust Proofing Machine in the Mahon Self-Housed Finishing System at Right.



Entrance End of the Mahon Flow Coater. Equipment is provided to maintain Paint at a Constant Temperature and Viscosity.



Mahon Control Panel which Houses Temperature Recorders, Control Switches, Signal Lights and Automatic Safety Devices.



. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!

Complete Mahon Self-Housed Finishing System Installed Adjacent to Manufacturing Buildings at International Harvester Company's Plant, Fort Wayne, Indiana.

SELF-HOUSED Mahon Finishing System OUTSIDE of PLANT Solves Many SPACE PROBLEMS!

In industrial plants where adequate space is not available, or where floor space and headroom restrictions would seriously interfere with the planning and the engineering of an efficient and economical production finishing system, Mahon engineers recommend installation of a Self-Housed Finishing System on the roof of the plant, or outside the plant adjacent to manufacturing buildings . . . the installation illustrated above is an excellent example. In such installations, no restrictions are imposed by either floor space or headroom; consequently equipment can be planned and coordinated for maximum efficiency. In this particular finishing system, the equipment is installed on two levels . . . the Five-Stage Metal Cleaning and Rust Proofing Machine, the Flow Coater, the Ventilated Drip Enclosure, and the Control Panel with Recording Instruments, are located on the ground level. The Dry-Off Oven, Finish Baking Oven, Oven Heating Units, and Air Supply and Exhaust Equipment are located above on the second level. The roof and walls, which house the complete system, are an integral part of the Oven Construction. This is a highly satisfactory Mahon solution of one manufacturer's production painting problem. When you are confronted with a finishing problem, you, too, will want to discuss it with Mahon engineers . . . you'll find them better qualified to advise you on both methods and equipment requirements. See Sweet's Plant Engineering File for Information, and typical Mahon Installations, or write for Catalog A-657.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

For more facts circle 512 on Reply Card

6,000 horsepower in a single CLARK CBA-8 balanced/opposed compressor

Now, for the really big applications, Clark introduces the most powerful compressor ever built—the new CBA-8. The ability to handle tremendous horsepower, however, is not the only feature of this new compressor. Being extra heavy and rugged in all respects, it is the perfect choice for those services where extremely high pressures are required such as in the process industries and for high pressure wind tunnel applications.

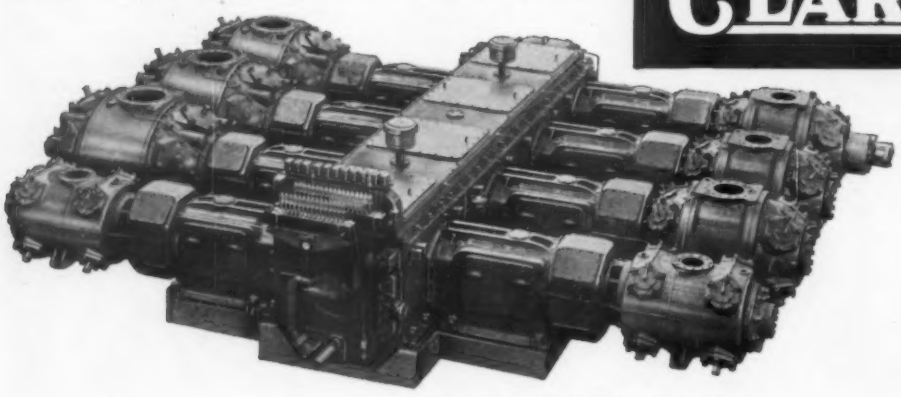
High discharge pressure invariably causes a high pressure rise across the cylinders which results in heavy pin loads. The new CBA-8 is designed to carry pin loads of 100,000 pounds with ease. For large air compressor installations, at normal pressures, the CBA-8 will operate with minimum maintenance because of its heavy construction. The balanced/opposed design principle, originated by Clark, assures vibrationless operation.

Two new CBA-8 units already have been delivered for a special application. Your Clark representative will gladly give you full details on this new unit.

CLARK BROS. CO. · OLEAN, N. Y.
One of the Dresser Industries
Sales offices in Principal Cities Throughout the World

Balanced/Opposed Compressors

CLARK®



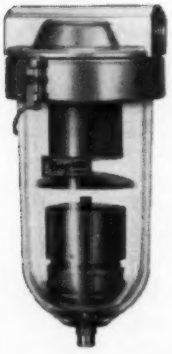
For more facts circle 513 on Reply Card

Good News Norgren

for design engineers and PLANT ENGINEERS

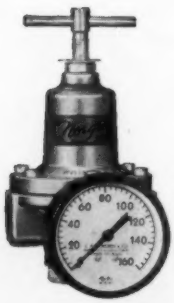
ANNOUNCES

Important New Developments in Compressed Air Filters and Pressure Regulators



NEW Norgren Air Line Filters

- **LESS PRESSURE DROP** — larger passages and larger filter element.
- **BETTER LIQUID REMOVAL** — Improved louver plate and baffle design. Removes more liquid from the compressed air line.
- **CHOICE OF FILTER ELEMENT**—interchangeable filter elements, 74, 64, or 25 micron.



NEW Norgren Pressure Regulators

- **GREATER ACCURACY OF REGULATED PRESSURE** — balanced valve and increased effective diaphragm area provide improved accuracy over a wide operating range.
- **RELIEVING OR NON-RELIEVING TYPE AVAILABLE**
- **IMPROVED RELIEVING CHARACTERISTICS** — automatic relief of excess pressure. Holds system pressure close to regulator setting.

For complete information...

call your nearby Norgren Representative listed in your telephone directory—or

WRITE THE FACTORY FOR NEW CATALOG.

C. A. NORGREN CO.

3443 SOUTH ELATI STREET • ENGLEWOOD, COLORADO

For more facts circle 514 on Reply Card

In JENKINS *Monel-seated Bronze Gates*

THE WEDGE* TAKES THE WEAR - *and spares the rings*

Easy replacement of the wedge only — right on the line — restores full efficiency

THE MONEL SEAT RINGS are expanded into the body to assure a positive, leak-proof joint. Exhaustive tests in typical monel-seated gate valve services show that this permanent all-around support of the rings is essential to guard against deforming, loosening, or shifting.

***THE RENEWABLE WEDGE** (bronze or nickel alloy) has excellent wear resistance, but has a lower degree of hardness than the heat-treated Monel rings, which have optimum resistance to erosion and corrosion as well as abrasion. Thus, wear of the wedge leaves the rings relatively unaffected. When necessary to renew the wedge, you simply remove the valve bonnet, slip the old wedge off the stem, and slip on a new one.

GET PRACTICAL, LOW-COST RENEWABILITY in the valves you choose for the tough, punishing services that require Monel-seated gates. Compare . . . there is nothing simpler, faster, or more economical than Jenkins replaceable wedge design — and you also get the *plus* of Jenkins *extra value* in every other feature. Jenkins Bros., 100 Park Ave., New York 17, New York.

***MADE WITH BRONZE OR NICKEL ALLOY WEDGE**

The bronze wedge provides lasting economy for most applications. The nickel alloy wedge provides extra resistance where rapid wear and corrosion are factors.

JENKINS BRONZE GATES WITH MONEL SEAT RINGS

200 psi	300 psi
Fig. 270-U, Bronze Wedge	Fig. 280-U, Bronze Wedge
Fig. 270-UN, Nickel Alloy Wedge	Fig. 280-UN, Nickel Alloy Wedge
Fig. 270-UL, Bronze Wedge, U.L. approved for L.P.G. Services	350 psi Fig. 280-UX, Bronze Wedge

JENKINS BRONZE GATES INCLUDE 40 DIFFERENT PATTERNS

125 • 150 • 200 • 300 • 350 psi SOLID WEDGE • SPLIT WEDGE
SCREWED • FLANGED • SOLDER END • SOCKET END QUICK OPENING

Call your local Jenkins Valve Distributor for complete information.

JENKINS VALVES

LOOK FOR THE JENKINS DIAMOND

SINCE 1864 TRADE JENKINS MARK

Jenkins Bros.

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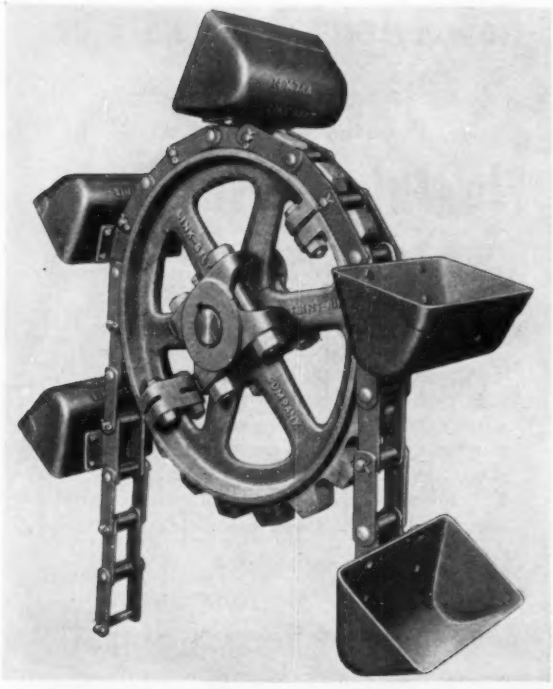
Link-Belt SS Class bushed chain outlives previous chain 4 times



LONG, TROUBLE-FREE SERVICE of SS-111 chain (above) proves that it pays to select the right chain for a specific job from Link-Belt's complete line. It also proves that there's no need to pay a premium for costly special alloy steel chains.

Outstanding record established in severe, abrasive elevator service

This remarkable service record set by a Link-Belt SS-111 bushed chain (left) proves that often there's no need to go to excessively costly special alloy cast chains to get long life. Used at an Indianapolis (Ind.) fertilizer plant, this chain handled an average of 75,000 to 80,000 tons of fertilizer before requiring replacement. The previous type of chain handled only 18,000 tons and required four times as much maintenance.

Designed for abrasive jobs

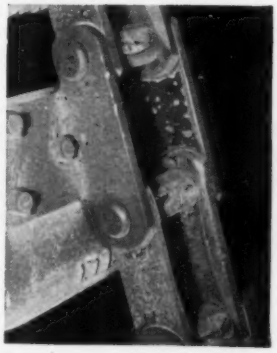
Link-Belt SS-111 bushed chain offers large joint bearing surfaces for greater wear resistance and trouble-free service in heavy-duty conveying and elevating. Sidebars of selected bar steel are accurately formed and machined for tight press fit of pins and bushings. The latter are made from tough, hardened steel and locked against rotation in sidebars.

These straight steel sidebars with hardened steel pins and bushings provide needed strength to prevent distortion under continuous heavy loads. Smooth, tough surfaces repel gritty materials, prevent packing in critical joints, resist abrasion and corrosion.

Many sizes of these heavy-duty chains are interchangeable with Link-Belt combination chains. And a wide range of attachments makes them adaptable to specific conveying and elevating requirements.

18 million tons, 26 years later... SS-856 chain still serviceable

Sets record in cement mill elevator service



The more than quarter-century of continuous handling of raw materials at a Pennsylvania cement mill illustrates the long-wearing durability of Link-Belt SS-856 elevator chain. This amazing service record under extremely tough conditions proves that it pays to pick the right chain from Link-Belt's complete line.

Link-Belt SS-856 chain is made of high carbon steel sidebars with nickel alloy pins and bushings. Hardened sidebars give additional strength plus greater resistance to wear and pitch hole distortion. In addition, accurately machined pitch holes assure proper pitch and tight press fit of mating parts —extend chain life. The hard, smooth surfaces of steel joints repel gritty materials . . . resist abrasion.

Link-Belt elevator chains are available with ultimate strengths up to 200,000 lbs.

Link-Belt SS-102½ bushed chain extends life of stone elevator

Several years ago an eastern stone quarry installed a main bucket elevator to handle 200 tons per hour of minus 2¼-in. mixed stone. Service life of the original two-strand elevator chain was found inadequate. After several shutdowns, it was replaced with Link-Belt SS-102½ chain with K-5 attachments at every third link.

This long-life, wear-resistant chain is now in its fourth year of uninterrupted operation. It has carried close to 350,000 tons as compared to 60,000 tons which was considered normal life for the previous chain.

Recent inspection of the SS-102½ chain reveals that it is good for another long stretch of service. Elimination of shutdowns and replacements more than justified the slight difference in cost between this and the original chain.

STONE ELEVATOR has buckets at every third link. Centers are 65 feet, with elevator inclined 75 degrees from the grade. Chain speed is 280 feet per minute.

HEADQUARTERS FOR CHAINS, SPROCKETS is your nearby Link-Belt factory branch store or authorized stock-carrying distributor. Write for 342-page Catalog 950.

LINK-BELT

CHAINS AND SPROCKETS

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,294

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Now...Local Availability on

Titeflex Flexible Metal Hose

for conveying "Problem" Liquids and Gases!

Titeflex Hose solves scores of problems in conveying organic and volatile liquids as well as corrosive gases. Connects moving and/or misaligned machine parts, other terminal joints. Withstands high extremes in temperature, pressure. Absorbs vibration, shock, and flexing . . . with ease. Sizes 3/16" to 3" Other tough conveyance problems are solved with Titeflex flexible hose made of TEFLON* in sizes of 1/4" to 1 1/4".

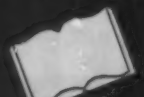
Titeflex Quick-Seal Couplings

—the ideal "connecting mate" for Titeflex Hose or *any other kind of quality hose*. Connects or disconnects in ONE second and . . . the higher the pressure the tighter the seal!

Both these time-tested products are available for immediate shipment from distributors' stocks in most areas. Otherwise write, wire, or telephone direct.

*Du Pont trademark for its tetrafluoroethylene resin

CALL YOUR LOCAL DISTRIBUTOR



Consult the yellow pages of your telephone directory

Your one source for both Hose and Couplings

Titeflex

TITEFLEX, INC., 536 HENDEE STREET, SPRINGFIELD 4, MASS.

For more facts circle 517 on Reply Card

BULLETINS just released and of immediate plant interest

PROTECTIVE COATINGS

101 Guide to Coatings—This 1957 Coatings Manual is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Illustrated in full color, this book contains information and recommendations to enable accurate determination of specific coatings needed for the job. Basic principle of Rust-Oleum's fish oil penetration into pores of metal is illustrated. Application photos give new ideas for protecting girders, tanks, piping, boilers, roofs, other surfaces. Over 100 color chips show colors available in primers, short-oil and long-oil coatings. Galvinoleum, heat resistant, chemical resistant, and floor coatings are covered separately. Booklet also describes masonry coatings, clear liquid sealer and Surfa-Etch solution. Rust-Oleum Corp.

102 Inorganic Zinc Coating—An inorganic zinc coating for structural steel, tank interiors, and exteriors, towers and equipment, which is unusually resistant to weathering, abrasion, salt and fresh water, solvents and petroleum products is described in this illustrated bulletin. General, physical and chemical properties are enumerated. Amercoat Corp.

103 Maintenance Coatings—"Paints, Emulsions and Coatings," is a small folder providing concise descriptions of eight roofing and dampproofing products for maintenance and repair purposes. These include an asbestos fibrated roof coating, a black asphalt coating, and others. The Philip Carey Mfg. Co.

CONSTRUCTION

104 Unit Wall System—This 12-pp brochure describes in detail an exterior curtain wall system using 10 standard modular components and permitting a total of 2852 possible design combinations, using the full range of sizes and types of panel, sash and doors. This system is designed for one-, two- and three-story buildings. Brochure includes specifications, typical assembly details, outline of erection procedure. Kawneer Co.

105 On Movable Walls—The full line of this company's movable metal walls, including a new series of aluminum partitions, is covered in a 68-pp 1957 catalog. Separate sections of book feature three other types of walls—flush pilaster, new executive, and commercial. More than 50 photos show typical industrial and other installations. Flexibility, economy, early occupancy, fire resistant construction and other advantages are detailed, and design features are fully illustrated. Accessories and hardware are also described. Booklet also provides specifications, dimensional drawings, data on sound control and insulation qualities. The Mills Co.

106 Welded Grating—Advantages of company's heavy duty welded grating suited for power houses, loading docks, oil refineries, fire escapes, drain grates, plating rooms, and filtration rooms, are detailed in this 8-pp bulletin. General engineering data and other information included. The Globe Co.

107 Acoustical, Thermal Insulation — Preformed liner for acoustical and thermal insulation is featured in this illustrated bulletin. Sound absorption coefficients and thermal conductivity are shown, and advantages enumerated. Insul-Coustic Corp.

108 Glass Insulation—Specifications for low temperature space installations are presented in 20-pp Booklet FL-101, which contains complete information on the latest recommended methods for installing Foamglas cellular glass insulation on walls, floors, ceilings and roofs of refrigerated spaces operating between —50 and 50 F. Lists suggested thicknesses as well as recommended adhesives, finishes, paints and other accessories for use with Foamglas in low temperature installations. Application data, specifications, and sectional drawings and photos are included. Pittsburgh Corning Corp.

109 Scaffolds and Ladders—Catalog A, 32 pp, describes scaffolds and ladders for construction, concrete shoring, plant maintenance and building repairs. The illustrated publication contains information on erection procedure, and covers technical data, uses and typical installations for each of the many types of built-up, suspended and swinging scaffolds. Wood, aluminum and magnesium ladders, as well as aluminum scaffolds are featured. The Patent Scaffolding Co., Inc.

STORAGE EQUIPMENT

111 Improved Storage System—Twenty-pp Catalog 505 presents a comprehensive description of the Stackbin system. Booklet contains many product illustrations and installation photos, and includes detailed data on dimensions and prices of individual products. Templates are provided to help you plan your own layout—a system to fit your plant needs can be estimated through the use of material provided. Covers bins, racks, combination equipment, shelves, hoppers, storage racks and containers. Stackbin Corp.

112 Desks and Cabinets—This 24-pp Catalog features descriptions and specifications on desks, files—both V expanding and rigid front—tables, chairs, cabinets, and accessories. Photos and line drawings of the various models are included, and design and construction features are detailed. Northwest Metal Products Co.

113 Steel Shelving—How to plan storage areas efficiently with company's steel shelving is featured in 36-pp Catalog ES-1087. The full line of convertible steel shelving with several new construction features is covered and a special section offers assistance to industries with storage problems. A typical flow chart shows how planning storage units according to "storage engineering" eliminates wasted space, time and effort in receiving, handling and distributing tools and products. Photos, descriptions of shelving accessories, tool storage units included. Berger Div., Republic Steel Corp.

MATERIALS HANDLING

114 Industrial Trucks—Catalog 357, 10 pp, describes company's line of industrial trucks and trailers, and includes general specifications and construction and design data. Photos of the various types are included. The Ohio Galvanizing & Mfg. Co.

115 Lift Truck Operation—"How to Operate a Lift Truck" is an informative 24-pp booklet designed for lift truck supervisors, operators, safety engineers and others. The cartoon technique used in the booklet is designed for easy reading and is packed with information about operation of a lift truck, preventive maintenance, safety and basic materials handling. Drawings for setting up an obstacle course are included. Hyster Co.

116 Bag Conveyor—An adjustable-length flat belt bag conveyor for package conveying, particularly in line with filling and sewing operations is described in Bulletin 0456. Describes operation of the conveyor and covers standard components available—basic unit and optionals. Various motor drives available are also discussed. Richardson Scale Co.

117 Chain Hoists—Catalog 61, 20 pp, describes construction and design features of company's multiple gear chain hoists, with a large cutaway view showing component parts included. A table of dimensions is given, as well as dimensional diagrams, shipping information, parts list prices and other pertinent data. Reading Crane & Hoist Corp.

On pages 205-206 are two postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

118 Wire Rope Cost Control—The Service-Score System for controlling wire rope costs is the subject of this illustrated folder. Described is an easy method of fact-finding to increase wire rope operating efficiency and help reduce supply and maintenance costs. Sample set of service-score stickers are included. Leschen Wire Rope Div., H. K. Porter Co., Inc.

VALVES, PIPING, FITTINGS

119 For Valve Selection—Circular 555, 24 pp, is designed as a guide for selecting valves, boiler mountings, and lubricating devices, including the LQ600 bronze globe valves, Luncor PVC all-molded valves, and solder end valves. Tables, technical data and information on the selection of valves, boiler mountings, and lubricating devices are completely indexed for easy reference. The Lunkenheimer Co.

120 Condensed Data on Valves—Bronze valves for heating and plumbing applications are pictured and described in Condensed Catalog 146. Special emphasis is given to heavy duty globe, gate and check valves. Also covered are radiator and circulator valves and fittings for steam, gravity and forced hot water heating systems, and company's standard line of globe, gate and check valves. Hammond Brass Works.

121 Packless Valves—Catalog F, 22 pp, describes packless valves for applications involving hazardous liquids and gases, as well as uses in nuclear energy installations. Each valve covered in detail contains a metal bellows as the packless feature. More than 20 cutaway views of different models are included. Detailed data on specifying and ordering, and charts on application and selection are provided. One chart lists resistance of various metals used in the valves to corrosive action of some 200 chemicals and gases. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

122 Air Release Valves—Bulletin 856 covers air release valves for venting air from hot water heating systems, venting air from chilled water cooling and air conditioning systems, and to release air from industrial and municipal pipelines and other equipment as water mains, water filters, tanks, brine lines, etc. Describes operation, lists outstanding features, and gives specifications. The V. D. Anderson Co.

123 Plastic Pipe, Fittings—Catalog P101 is an 8-pp engineering booklet providing technical and descriptive data on plastic pipe, fittings and valves. Prepared with process industry installations in mind, this catalog includes comprehensive tables detailing both physical properties and chemical resistance of the three basic plastic compounds used; PVC, Styrene Copolymer and Buna-N. Also lists sizes of fittings, dimensions and working pressures of pipe, and sizes and types of valves covered. Vanton Pump & Equipment Corp.

PUMPS, COMPRESSORS

125 Centrifugal Pumps—Bulletin P-3b describes custom-built, off-the-shelf, high-speed centrifugal pumps for handling clear liquids and fine slurries. Advantages are detailed and complete specifications are listed on insert sheet P-3c-In. Ampco Metal, Inc.

126 Reciprocating Compressors—Bulletin DS-361 is a 28-pp revised booklet on reciprocating compressors and includes ratings and data on company's 125- and 150-hp compressor and condensing units. Ratings on 60-, 75- and 100-ton condensers have been revised to conform with a new condenser which incorporates water heads at both ends. Roughing-in dimensions have been changed for units with motors of 30 hp and smaller. General compressor design features, and details on gas flow and lubricating system are provided, also capacity data and specifications. The Trane Co.

ELECTRICAL

127 Shaded Pole Gear Motors—Detailed product descriptions and illustrations of fractional horsepower shaded pole gear motors and counters, attended by schematics, performance figures and torques, are presented in this 12-pp catalog. Specifications and other details are included. Electro Counter & Motor Co.

128 Voltage Regulators—Descriptive data on company's step voltage regulators are supplied in two new booklets—12-pp Bulletin

BULLETINS

(Begins on page 21)

GEA-5752C and Bulletin GEA-6552. The illustrated booklets cover design features, applications, wiring diagrams and electrical data for 20 single-phase ratings and 77 three-phase ratings. Both brochures on step regulators plus one on induction feeder regulators are included in a single package "Your Guide to Profitable Voltage Regulation", GED-3133. General Electric Co.

129 Emergency Transformer Capacity—Ways to utilize hidden transformer capacity during a long shutdown of a large power transformer are described in 8-pp Bulletin 01R8529. Pointing out that transformer temperature determines its capacity, various methods of cooling the unit are described including the dual cooling system. Allis-Chalmers Mfg. Co.

130 Outdoor Breakers—Design features of company's intermediate outdoor oil circuit breakers in ratings of 14.4 kv to 69 kv, 500 mva to 3500 mva, are described in Bulletin 71B-8475A and its supplement. Includes a description of the Pneu-Draulic operator, previously available only on the company's large tank type breakers, and the portable power operated hydraulic tank lifter along with portable battery operated unit for use on breakers with pneumatic or solenoid operators. Allis-Chalmers Mfg. Co.

131 Packaged Substations—Bulletin SB1, 28 pp, describes company's packaged steel substations for a variety of distribution applications. Typical bills of material for each design are shown for various operating voltages. Engineering, ordering and shipping method is explained and basic information on structural strength and structure foundations is included. Line Material Co.

132 Cable Installation Tips—Publication 19-606 is a 36-pp booklet on installation practices for company's interlocked armor cable systems. Booklet is devoted to photos showing terminations and splices; connections to switchgear, motors and plug-in bus; special installation problems; typical installations; and "before" and "after" illustrations showing the older wiring system side by side with the new interlocked armor cable system. General Electric Co.

133 Varnished-Cambric Cables—Bulletin VC-56, 22 pp, covers varnished-cambric cables in a voltage range of 600 to 5000 v for single and three conductor cables braided or lead sheathed. Armored cable constructions in both galvanized steel armor and aluminum armor are shown in 3 and 4 conductors. The engineering data section covers such items as conductors and conduits, insulation thickness, tests, braid and finishes, shielding, lead thickness, armored cable racks and components, terminators for interlocked cable, electrical circuit formulae. Rockbestos Products Corp.

134 Heavy Duty Switches—Form 84-222, 10 pp, describes company's heavy duty precision switches for machine tools and other industrial equipment. Advantages of the various types of switches in the line are detailed, along with specifications and other technical data. Photos, dimensional diagrams showing component features, actuation design data, and a table of circuitry variations included. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

135 Capacitors and Capacitor Blocks—Two new bulletins on secondary capacitors and capacitor blocks are announced. Bulletin PC-7 describes a line of capacitor blocks rated 250 to 1200 kvar at 2400 to 7960 v, and gives weights, dimensions, ratings, accessories, and ordering information. Bulletin PC-3 describes secondary capacitors rated 3, 5, 7½ and 10-kvar at 240 v. Application data, design features, weights, dimensions, and ordering information included. Line Material Co.

136 Brushes For Tool Motors—Some 250 carbon brushes for electric tool motors are described in 34-pp Catalog 20 (87-C). Organized for ease of brush selection, this catalog covers brushes for a range of tools including hammers, drills, saws, sanders, grinders, screwdrivers, valve refacers, others. Tools are illustrated, identified by brand, type and model numbers. Book is available to qualified plant engineers, please state your job title when requesting it. The Ohio Carbon Co.

137 Emergency Light-Protection—How automatic battery charge control enables emergency lighting units to give greater protection against perils of lighting failures with less maintenance is told in illustrated Bulletin 5926. In addition to photos of the units, folder contains an operation chart demonstrating automatic charge control, and charts showing beam coverage, light intensity and protection time. Exide Industrial Div., The Electric Storage Battery Co.

138 Lift Truck Batteries—Two recent specification bulletins cover this company's Slyver-Clad batteries for use with industrial trucks. Bulletin IT-525/56 describes those for use with hand motorized lift trucks, and Bulletin IT-524-56, those for rider-type electric trucks. Both provide data on battery ratings and capacities, details of design and construction, dimensions. C & D Batteries, Inc.

MECHANICAL POWER TRANSMISSION

140 Precision Stock Gears—Many new items have been added to 88-pp Catalog E-88 on precision stock gears, including the miniature slip clutch. Complete engineering information is presented in tabulated form on the various types of precision stock gears, and dimensional diagrams showing important features are included. Additional information is offered on a fly-leaf in back of the catalog. Dynamic Gear Co., Inc.

141 Flexible Couplings—Eight-pp Bulletin CPI-56 contains complete descriptive information on flexible couplings, together with engineering data, horsepower ratings, parts lists and prices. Photos and dimensional diagrams are included, and the data are presented in convenient tabulated form. Acme Chain Corp.

142 Clutch Products—Engineering Manual Number 56, 76 pp, is a comprehensive catalog on automatic freewheeling clutches; combination clutch-couplings; backstops to prevent reversed runaway of inclined conveyors or vertical elevators; and new, enclosed freewheeling clutch units for continuous operation under extremely adverse conditions. Manual contains large illustrations, together with explanatory schematic lay-out drawings showing installation and operating details. Operating principle is explained, and engineering tables, dimensions and weights given. Marland One-Way Clutch Co.

143 Sprag Clutches—How the sprag concept offers maximum clutch performance is detailed in 26-pp Catalog 104-C. Applications are fully described, typical mounting arrangements diagrammed, and enginering data, dimensions, installation and maintenance, and ordering information included. Formsprag Co.

FANS, VENTILATING

144 Centrifugal Fans—Sixty-pp Bulletin C-103 lists manufacturer's latest line of backward curved blade centrifugal fans and features performance charts. These fans are described for a wide range of ventilating, air conditioning and heating applications, and suitable for belt or direct drive. Specifications, special features available are covered, and selection information is included. The Type B fan wheel described is non-overloading and self-cleaning and operates at high efficiencies. Chicago Blower Corp.

145 Ventilating, Exhaust Systems—This 12-pp brochure on corrosion-proof ventilating and exhaust systems covers thermo-plastic corrosion-proof centrifugal fans, ducting and fittings, and hoods. Of particular interest is a section devoted to a discussion of polyethylene and non-plasticized polyvinyl chloride centrifugal fans. Specifications, performances and other data are presented in chart form, and photos, drawings and diagrams are included, as well as price list. American Agile Corp.

146 Induced Draft Bifurcator—Bulletin DB-44-56 contains 20 pp of useful information on company's induced draft bifurcator which provides instant, adequate draft and eliminates tall, costly stack. Manufacturer's boiler code ratings are reduced to their common relationship of Btu/hr delivered to the steam. Also included are tables and charts on volume of flue gas for oil, gas and coal, selection data, performance data, and specifications. DeBothezat Fans Div., American Machine and Metals, Inc.

Reader Service Cards for ordering catalogs are on pages 205-6. Be sure to include your name, job title, and company, even if you want catalogs mailed to your home address.

LIGHTING AND COMMUNICATION

147 Directional Reflector Lamp—This illustrated brochure depicts new light control for industry through a directional reflector fluorescent lamp manufactured by the company. Provides general information and describes applications in a variety of industries. Sylvania Electric Products Inc.

148 Electric Ballasts—Bulletin GEC-983J, 12 pp, is a selection guide covering company's line of fluorescent lamp ballasts. Contains data on weatherproof ballasts, wiring diagrams, list prices, and electrical specifications for ballasts for general line fluorescents, plastic signs and outdoor applications, dimming and flashing, germicidal fluorescents, rapid-start and circline lamps, and d-c operation. General Electric Co.

149 Closed-Circuit TV—Comprehensive 28-pp Form CCTV-41056 is a guidebook to latest broadcast equipment and systems for color and black-and-white closed-circuit television service in industrial and other fields. The booklet employs color and monochrome photos, diagrams, and sketches to describe nature and applications of company's line of broadcast closed-circuit TV equipment. Describes signal distribution systems, control consoles, associated studio equipment, and special-effects equipment for production of split-screen, dissolves, fades and other effects. Radio Corp. of America.

HEAT TRANSFER

151 Cooling Towers—Bulletin 477-A, 12 pp, describes company's 3-B Series of cooling towers, including 24 popular sizes for almost every air conditioning and refrigeration need. Dimensions and approximate weights are indicated on a table, and selection tables, general specifications, construction features, applications, and photos of typical uses are included. Binks Mfg. Co.

152 Heat Exchangers—This company's Hi-Temp heat exchangers, for service in heat transfer of most commercial acid, alkaline and salt solutions within a range of 35 to 200 F, are presented in this 8-pp bulletin. Reduced maintenance costs, decreased steam consumption, and other advantages are discussed in detail. General data on the exchangers and a selection chart given. Nukem Products Corp.

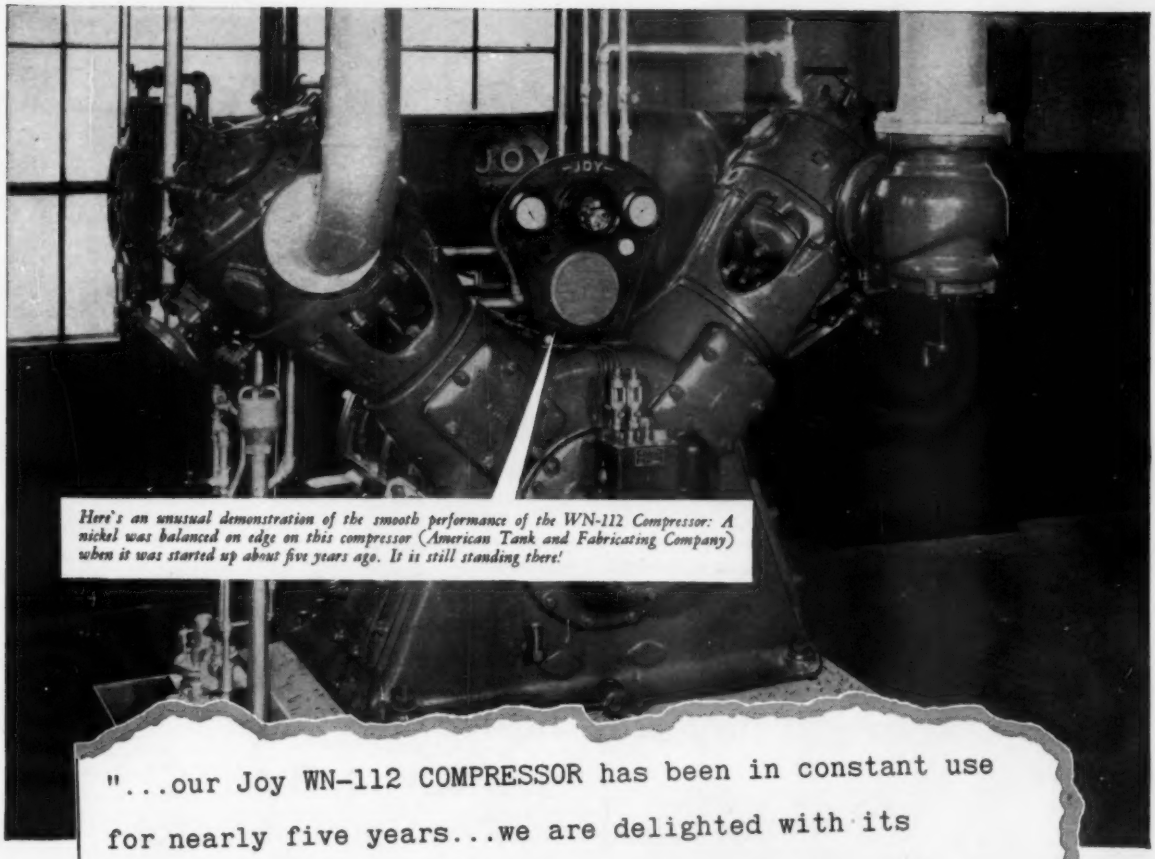
INSTRUMENTS, CONTROLS

154 Liquid and Gas Control—General Catalog 005, 38 pp, describes company's line of equipment for the measurement and control of liquids and gases. Illustrated are many types of controllers, gages, manometers, recorders, meters, valves, Venturi tubes, etc., all applicable for water and sewage handling, power and processing industries. Photos, drawings, head loss curves, specifications and dimensional data included. Simplex Valve and Meter Co.

155 Process Control Instruments—Customized process control instrumentation for indicating, recording, controlling and transmitting flow, pressure and density is covered in 32-pp Catalog 2. Meter capacities for air and water are given, and sizing nomographs are supplied for converting capacities to other fluids. Photos, dimensional drawings and specifications included. Fischer & Porter Co.

156 Temperature Regulators—Bulletin TR-57 describes the construction and function of company's 650 Series of temperature regulators featuring a balanced type of construction and vapor pressure operation. Application information is included, as well as data on dimensions and weights, installation, servicing, and photos and drawings showing component features. Atlas Valve Co.

(More Bulletins on page 207)



Here's an unusual demonstration of the smooth performance of the WN-112 Compressor: A nickel was balanced on edge on this compressor (American Tank and Fabricating Company) when it was started up about five years ago. It is still standing there!

"...our Joy WN-112 COMPRESSOR has been in constant use for nearly five years...we are delighted with its vibrationless performance."

George F. Franck, Vice President
American Tank & Fabricating Company,
Cleveland, Ohio

There's no better story than a satisfied customer—

Write for FREE Bulletin 142-15

A complete 28 page description of the WN-112 Compressor . . . section drawings, specifications and other useful information on heavy-duty compressor design and selection.

Nearly five years of absolutely *trouble-free* service is a performance of merit for any continuous-operation machinery. As a matter of fact, though, many of the original Joy WN-112 Compressors, built *two decades ago,* are still giving dependable service to satisfied owners.

Joy pioneered the use of high-rotation speed in heavy-duty compressors . . . were the first to bring to industry the many advantages of this new concept. The V-vertical design with flange-mounted motor resulted in a *compact*, heavy-duty continuous-service compressor that minimized vibration and paid off in trouble-free air power for industrial plants everywhere.

For more information, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Co. (Canada) Limited, Galt, Ontario.*

WBW 16412-142

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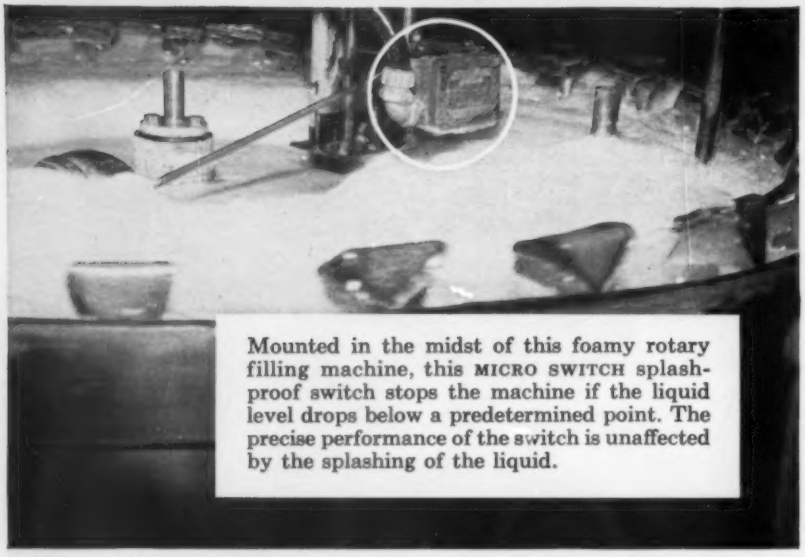
For Air and Gas Compressors,
Vacuum Pumps and Boosters,
Conveyors, Fans, Electrical Connectors

JOY

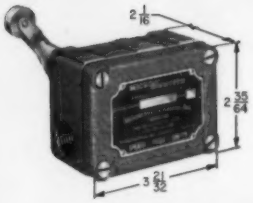
SPECIALISTS IN THE COMPRESSION AND MOVEMENT OF AIR AND GASES SINCE 1885

For more facts circle 518 on Reply Card

MICRO SWITCH . . . FIRST IN PRECISION SWITCHING



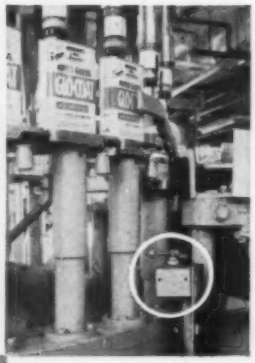
Mounted in the midst of this foamy rotary filling machine, this MICRO SWITCH splash-proof switch stops the machine if the liquid level drops below a predetermined point. The precise performance of the switch is unaffected by the splashing of the liquid.

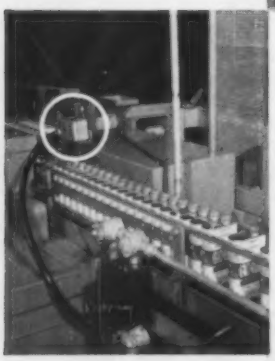


MICRO SWITCH Splash-Proof Switches are constructed to resist the splash of liquids. A seal on the actuating shaft and a gasket on the cover gives a good seal against normal splash conditions. A heavy aluminum housing protects the enclosed switch. These switches combine long electrical life with accurate repeatability. They are available with adjustable roller-arm actuators (shown) or with push-rod plunger actuators. Can be supplied with a variety of electrical ratings and contact arrangements.

Splashed all day with liquid wax...

MICRO SWITCH precision switch is used to prevent "jam up" on a rotary can-filling machine. If the platform sticks and does not lower to the level of the conveyor, the switch stops the conveyor until trouble is corrected.





Switch at the left is held operated by the nozzles of the cans. Should a can be upset, or reversed, the switch actuator releases, opens the circuit and the conveyor stops. Another switch keeps track of the supply of knock-down shipping cases, in a similar manner. It stops the conveyor if the supply is low.

MICRO SWITCH Precision Switch performance is unaffected

MICRO SWITCH controlled equipment is faster and more efficient—produces more in less time. Thousands of plant superintendents, electricians and maintenance men have made their equipment "perk up" with MICRO SWITCH precision switches.

Johnson's Wax Company engineers chose splash-proof MICRO SWITCH precision switches to control packing equipment in their modern Racine plant. From controlling the level of the rotary filling machine, through every packaging step, MICRO SWITCH units insure safe, efficient operation as over 200 cans are filled in each line per minute.

There is a MICRO SWITCH distributor near you. Let him show you a variety of switches and practical applications that have paid off for others. Send for MICRO TIPS DIGEST. It's jam-packed with ideas.

See MICRO SWITCH Catalog No. 83 for complete information on the wide line of heavy-duty precision switches for industrial use. Wire today.

MICRO SWITCH

A DIVISION OF MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

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For more facts circle 519 on Reply Card

USING

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in industry

Electrically conductive troweling compound makes floors sparkproof

HYPALON® gaskets still serviceable after two years, 2% ozone exposure

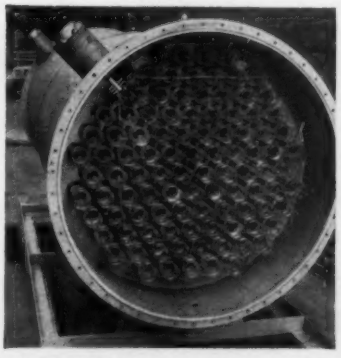
A large chemical firm has used gaskets of HYPALON synthetic rubber in its ozone generators for two years. Despite constant exposure to 2% ozone during that period, not one gasket has shown any sign of ozone cracking.

The ozone generator (see below) is a steel shell packed with glass tubes. As dry oxygen passes through the tubes, it is converted to ozone by high-voltage electrical discharge. The ends of the steel shell are closed with dished heads sealed with gaskets made of HYPALON.

Formerly, the manufacturer of the generator used plastic gaskets. Though unaffected by ozone, the gaskets took a permanent set under flange pressure and couldn't be reused.

Additional advantages . . .

HYPALON has many other advantages. Compared to other kinds of rubber, it shows unusual resistance to hardening at elevated temperatures (250°-350°F.). HYPALON resists strong oxidizing chemicals, too. Indoors or out, products of HYPALON can cut maintenance costs for you on the really "tough" jobs where severe conditions exist. Just clip coupon for further information.



GASKETS of HYPALON are used to seal each end of this ozone generator.

For more facts circle 520 on Reply Card

EASY TO APPLY; CONDUCTIVITY IS STABLE AND DEPENDABLE . .

In an ammunition factory, electrically conductive floors are a must. They drain off static electricity that might otherwise cause a spark. Over the years, Remington Arms, at their Bridgeport plant, had tried all kinds of conductive floors, and all were troublesome in one way or another. They wore out too quickly, or were hard to repair, or their conductivity fluctuated too much under repeated washing. (Some areas of the plant are washed down five times a day.)

Eight years ago Remington found the material that has now become their standard. It trowels on like mortar, but instead of the conventional sand-cement-water combination, it consists of neoprene latex combined with a special hydraulic cement, a wear-resistant aggregate, and conductive particles. Neoprene plays three roles in the formulation. First, because of the latex in the mixture, the mortar bonds securely to wood or concrete subfloors. Second, neoprene makes the mortar sufficiently flexible to prevent chipping and cracking of thin, surface applications. And third, neoprene acts as a binder for the conductive particles to prevent their being "tracked" away or leached out by repeated washing.

Remington now have some 50,000 sq. ft. of the material in their plant and are convinced that it overcomes their objections to the floorings they tried before. Conductivity of the entire floor is checked every month and stays well within tolerable limits. Wear resistance is reasonably good, and areas of heavy traffic may be built up again simply by troweling new material over the old. A good indication of the flooring's quality as a floor, apart from conductivity, is the fact that Remington has put a non-conductive variant of it in their machine shop, where its advantages are comfortable resilience underfoot and resistance to oil and grease.

MORTAR is spread about ¼" thick. It contains neoprene latex to prevent chipping and to promote adhesion to subfloor.

NEOPRENE OFFERS YOU MANY ADVANTAGES—whether you use it as flooring material or in hose, conveyor belts, V-belts, gloves or any of the many rubber products required by industry. It gives you long cost-saving service on jobs where many ordinary methods quickly fail. It cuts your maintenance and replacement costs with its extra durability under conditions of extreme service. For more information about it, just mail the coupon.

DU PONT
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HYPALON *is a registered trademark of E.I. du Pont de Nemours & Co. (Inc.)*

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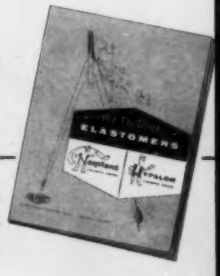

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You get this high capacity in Nicholson steam traps through effective use of a large orifice. And you get much more—simplicity of design and quality through and through.

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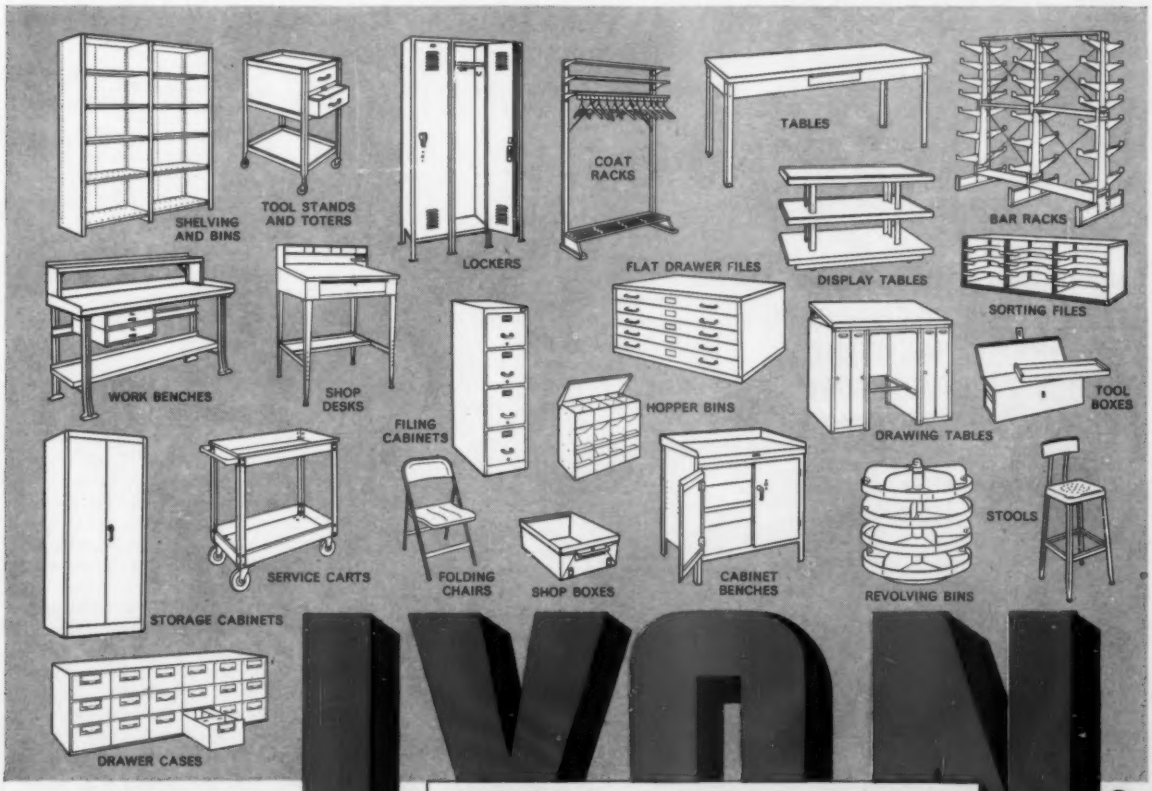

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REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Write for free "LUBRIPLATE DATA BOOK"... a valuable treatise on lubrication. LUBRIPLATE DIVISION, Fiske Brothers Refining Company, Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 523 on Reply Card

BACKTALK and FORETHOUGHTS

Edited by Marjorie E. Weissman

Training Film Sources

PLANT ENGINEERING:

"We are at present setting up a program of training courses for our Electronic personnel and would appreciate it very much if you could advise us how we may obtain films and descriptive literature on the subjects listed on page 118 of the November, 1956 issue of PLANT ENGINEERING." *E. V. Neuser, Lederle Laboratories Div. American Cyanamid Co., Pearl River, N. Y.*

► The package program mentioned in the article, "Electronics Training at Chrysler" consists of 12 self-controlled lessons in electronics in black and white slide films (35 mm and keyed 16-inch, 33⅓ rpm records); 10 sets of review booklets (12 per set); and one instructor's manual (GEZ-232). These packaged training programs are offered at cost to interested industries and circulated primarily to plant management, production men, electrical maintenance staffs and engineers. The person to contact for more information about these films is: Miss Helen M. Daly, Film Librarian, General Electric Co., 570 Lexington Ave., New York, N. Y.

Films "The Triode: Amplification"; "The Diode: Principles and Applications"; and "Principles of Gas-Filled Tubes" can be obtained on loan or purchased from several sources including the film libraries of New York State Department of Commerce; and New York University; also from Ideal Pictures in Buffalo, N.Y.; and United World Films in New York City.

More information on "RCL Capacitance" may be obtained by writing to the Training Aids Officer, Film Library, Building 3009, Great Lakes, Ill.—*Editors.*

P V C Again

PLANT ENGINEERING:

"Please send us complete information on the 'PVC Tank Liner' on which there was an article in the October, 1956 issue of your publication." *W. W. Dodge, Staff Engineer, Mfg. Genl. Office, Plant Engineering, Caterpillar Tractor Co., Peoria Ill.*

► Readers in search of more information on the polyvinyl chloride tank liner should write to Mr. Francis Donovan, Div. Engineer, H. N. Hartwell and Sons, Inc., Industrial Plastics Div., Park Square Building, Boston 16, Mass.—*Editors.*

Cleaning Fluid Danger

PLANT ENGINEERING:

"In your October, 1956 issue, the authors of the article 'How To Clean Hydraulic Systems,' mention the use of carbon tetrachloride for cleaning parts of hydraulic pumps, valves, etc.

"May I call your attention to an important article in the October, 1956 issue of *McCall's* magazine on the dangers of using carbon tetrachloride for cleaning. A digest of this article appears in the December, 1956 issue of *Readers Digest.*

"I know that many plant engineers and maintenance men use this compound for cleaning, never realizing the dangers involved.

"I believe PLANT ENGINEERING could render its readers a valuable service by calling attention to this article or by reprinting it in your valuable magazine." *R. C. Heinmiller, Dearborn, Mich.*

► We agree most heartily with Mr. Heinmiller's comments on the dangers of using carbon tetrachloride for cleaning and slipped in omitting such a reference to it in the article mentioned. This is particularly true in view of the fact we have, in the past, published articles calling attention to the dangers inherent in the use of many solvents.—*Editors.*

Tracing Underground Lines

PLANT ENGINEERING:

"Do you have any information on tracing underground sewer lines?" *F. D. Chaffee, Superintendent, Middlebury College, Middlebury, Vt.*

► PLANT ENGINEERING has published several articles which might help solve this reader's problems and copies of them have been sent to him.—*Editors.*

Lighting and Color

PLANT ENGINEERING:

"First, I should like to compliment your magazine for the splendid articles you sent me on industrial lighting. They were of particular interest because they dwell so strongly on the problems of glare and color. You see, we have been concentrating on these same problems for six or seven years.

"One of the articles, 'Light Sources for Color Matching' from your December, 1956 issue, mentions that light sources should be uniform so that both 'producer and customer have a similar source of light for making color comparisons which is acceptable to all concerned.' It has been our aim to create color correction in the fluorescent lamp itself so that existing installations can be used in achieving this result.

"Just recently we have been conducting some experiments on the reactions of groups of people on variations in the specifications of one of our lamps. We found that we could vary from our specification four times further into the green

In water conditioning... one grows taller than the rest!

W. H. & L. D. BETZ, Philadelphia, Pa.

Bendix Foundry Solves Belt Conveyor Problem

Bendix Aviation Corporation's South Bend plant was plagued with a stubborn belt conveyor maintenance problem. Foundry sand was lodging in steel belt idlers, causing them to freeze up. Despite frequent inspection and lubrication tours the frozen idlers sometimes cut through the belt making complete replacement necessary. Replacing a single idler required a two hour shutdown.

Then Bendix discovered a new way to handle the conveyor system. During a single weekend all the steel idlers were replaced with Joy Limberoller idlers. The Joy Limberoller is a single roller consisting of a series of pressure-molded neoprene discs on a flexible steel cable. Only two bearings are used and these are up out of the dirt zone. Two years after the Limberoller idlers were installed Bendix reported, "No Limberollers have been replaced—not one belt has been torn by an idler—and the inspection and lubrication tours have been completely discontinued."

The Limberoller idler works equally well with other difficult materials—coal or chemicals—ores or fertilizers. What's your materials handling problem? Get help from *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.* In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 132-15

Consult a Joy Engineer

For Air and Gas Compressors, Vacuum Pumps and Boosters, Conveyors, Fans, Electrical Connectors

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For more facts circle 525 on Reply Card

BACKTALK

area of the spectrum than we could into the red before a difference was noted by viewers. There could be many conclusions drawn from this experiment. For instance, it might prove our theory that the color green is easier on the eye and that the eye can see more of the greenish wave length than any other. This was of course, the theory of Steinmetz, the scientist. It could be further proof that color has a definite psychological effect on humans since a slight move into the red spectrum was observed four times quicker than into the green." *Stuart G. Nelson, President, Sunray Products Corp., Warren, Pa.*

Maintenance of Machine Tools

PLANT ENGINEERING:

"I am currently engaged in a project to set up a preventive maintenance program for machine tools. These consist of the usual milling machines, lathes, grinders, jig borers and drill presses found in a tool room.

"If you have any information which might be useful, or if you can suggest some appropriate sources, I would be most grateful to you." *O. Limbursky, Assist. Tool Room Foreman, Signode Steel Strapping Co., Chicago 47, Ill.*

► "Industrial Maintenance," a booklet containing 12 articles reprinted from past issues of PLANT ENGINEERING contains several articles which should be helpful in organizing a machine tool maintenance program.—*Editors.*

Apple Pie Problem

PLANT ENGINEERING:

"Do you have any information regarding a measuring pump that may work for pumping hot apple syrup into apple pies? At the present time we are using an air operated grease pump which does a very good job. However, as this pump was designed for grease and consequently is self-lubricating, it presents a corrosion and gumming or sticking problem with apple juice, which is not very corrosive.

"We replaced the pump tube with one of stainless steel and also the plunger rods with stainless. Other parts are not easily converted to stainless and the packing gland also gives us trouble." *Harry R. Logiodice, Chief Engineer, Liberty Baking Co., Pittsburgh, Pa.*

► Mr. Logiodice's problem was passed along to William Schieb, Instructor in Maintenance in the School of Baking at the American Institute of Baking in Chicago, Ill. Here is his answer:

"This seems to be a general problem inasmuch as no one seems to have the complete answer or they are not satisfied with what they are using. The only question I have is are you using the right model pump? It is my understanding that there is a pump such as you use made of all stainless steel, with the related parts designed to withstand the corrosive action of lactic acid and temperatures up to 165F.

Should you come up with the answer to your problem I would be very much interested in hearing from you and, of course, I will be happy to forward to you any information I may receive in this respect."

► Any comments?—*Editors.*

Reprinting P.E. Articles Abroad

PLANT ENGINEERING:

"The Shell Petroleum Company, Ltd., in England have received a copy of a reprint of the article entitled 'Epoxy Corrosion Preventers—Guide to Steel Protection with Emphasis on Epoxy Formulations,' which appeared in the October, 1956 issue of PLANT ENGINEERING. They would like to reproduce this article

to assist them with their sales development work in Great Britain.

"Accordingly, it would be appreciated if you would give your approval for the reproduction of this article for their sales promotion work. Proper credit, would, of course, be given to PLANT ENGINEERING." *A. V. Snider, Manager, Export Department, Shell Chemical Corp., New York, N. Y.*

► As always, we are pleased to hear that articles published in PLANT ENGINEERING are proving of real use to our readers both at home and further afield, and are happy to give permission to reprint the article on epoxies.—*Editors.*

Maintenance Information

PLANT ENGINEERING:

"If prints of the article 'Maintenance According to Schedule' from the May, 1956 issue of your publication are still available, I would appreciate receiving a copy.

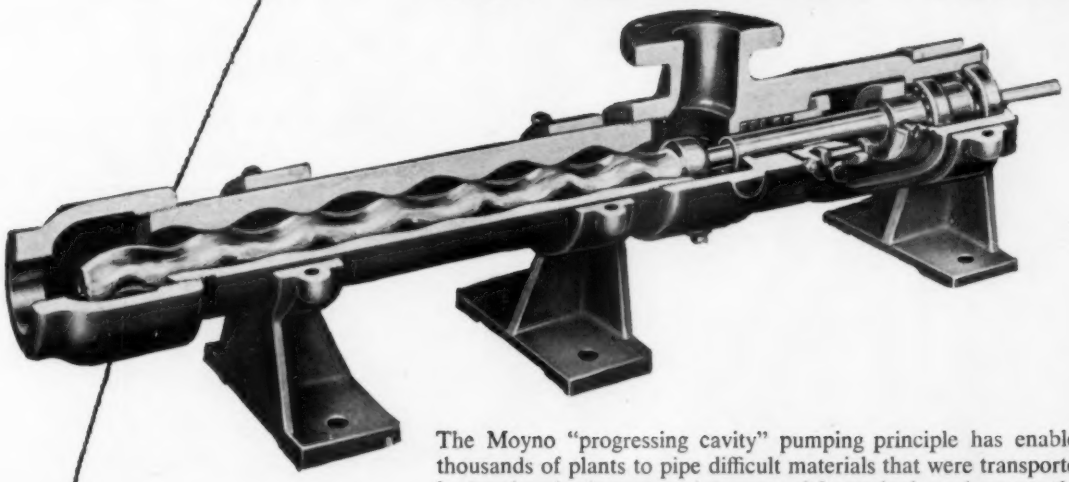
"Also, a mimeographed copy of the maintenance instructions described, samples of as many as possible of the various forms used and whatever other information is available." *W. C. Fisher, Administrative Assistant, Detroit Controls Corp., Control Engineering Unit, Norwood, Mass.*

► Selected articles which we hope will help Mr. Fisher have been sent to him in addition to the tear sheets.—*Editors.*

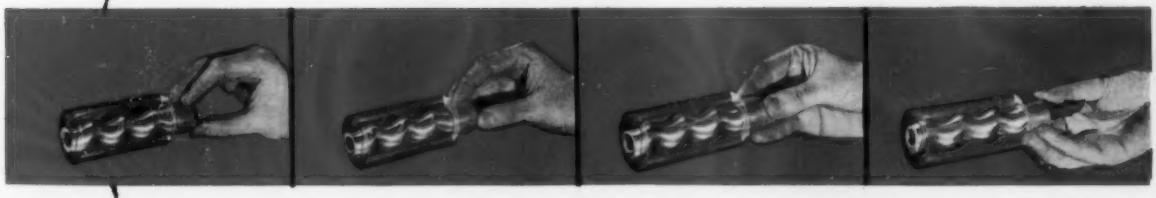
from abrasive slurries to delicate foods . . .

MOYNO® PUMPS

CUT HANDLING COSTS



The Moyno "progressing cavity" pumping principle has enabled thousands of plants to pipe difficult materials that were transported by hand and other expensive means. Moyno is the only pump that can handle many abrasives, pastes, slurries, chemicals, foods, suspended solids, etc. without foaming, aerating, crushing or excessive pump wear.



As shown above, Moyno Pumps have a screw-like rotor that revolves in a double threaded stator creating progressing cavities which smoothly move material through the pump. They will pump anything that will move through a pipe . . . even plaster and non-pourable pastes!

Moyno Pumps are available in capacities up to 500 gpm and pressures up to 1000 psi.

Examine your processing methods. No doubt there are several places where Moyno Pumps can drastically cut costs. Ask us, we'll give you a frank answer. Send us an outline of your problem today! Write for Bulletin 30-PE

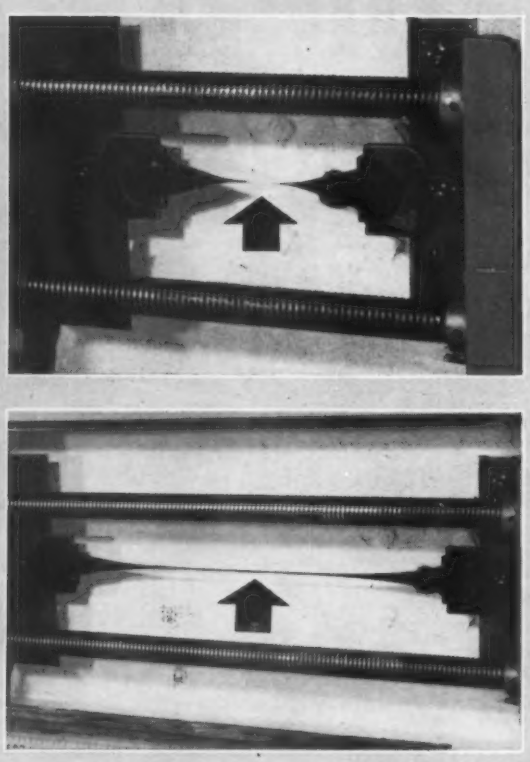
ROBBINS & MYERS, INC.

SPRINGFIELD, OHIO — BRANTFORD, ONTARIO

Motors Fans Hoists Moyno® Pumps Propellair® (Industrial) Fans

For more facts circle 526 on Reply Card

Johns-Manville *Aquadam*® Built-Up Roofs—proved superior by actual tests!



Here's conclusive proof of Aquadam's greater resistance to cracking!

TOP—A typical asphalt is shown at average breaking point of 12 CM.

BOTTOM—This is Aquadam at a 25 CM stretch—100% beyond average—won't break even when stretched to 110 CM.

AQUADAM BUILT-UP ROOFS owe their proven superiority to Aquadam, the special bituminous cementing agent, used in the application of the roofing felts. Aquadam is an exclusive Johns-Manville development.

When applied, Aquadam's excellent adhesive properties create a permanent bond to the felts and to the slag or gravel surfacing. Aquadam's rigidly controlled quality and excellent flow properties assure easier mopping, thorough coverage, longer roof life.

Johns-Manville Aquadam Roofs are specially designed to provide maximum built-up roof service for deck inclines from dead level to ½" per foot. Available in both a smooth-surfaced and a slag or gravel specification.

Your local Approved J-M Contractor is listed in the Yellow Pages of your telephone directory. He will gladly give you complete information about J-M Aquadam Built-Up Roofs. Or, write Johns-Manville, Box 158, New York 16, N. Y. In Canada: 565 Lakeshore Rd. E., Port Credit, Ont.

JOHNS-MANVILLE JM PRODUCTS

CHECK THESE 7 IMPORTANT AQUADAM ADVANTAGES:

- ✓ Outstanding resistance to cracking
- ✓ Improved self-healing properties
- ✓ Superior weather resistance
- ✓ Greater kettle stability
- ✓ Exceptional adhesion, stronger bond
- ✓ Greater resistance to water
- ✓ Excellent uniformity

Johns-Manville

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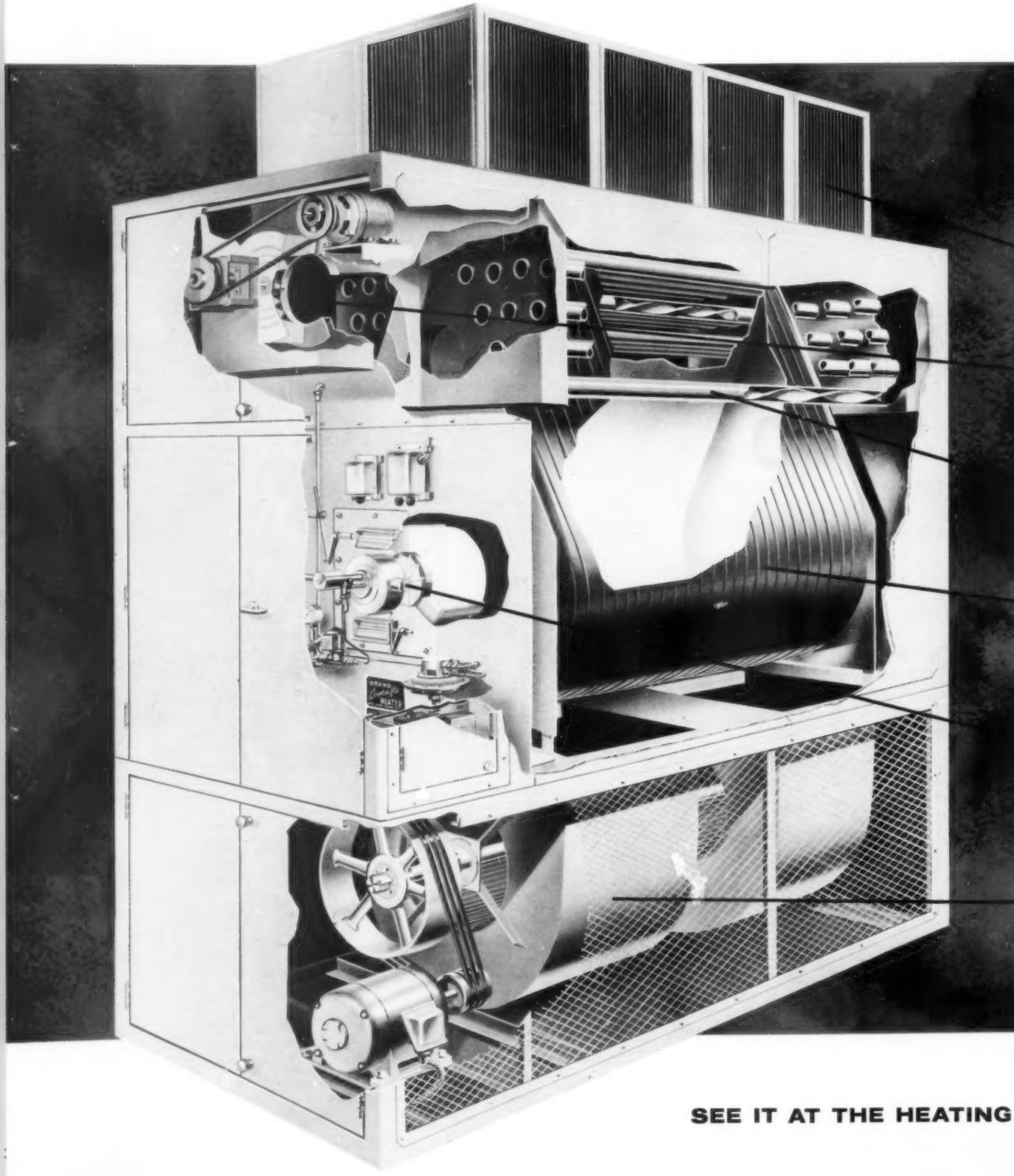
The BIGGEST NEWS in SPACE HEATING

The ALL-NEW DRAVO

with the revolutionary



SEE IT AT THE HEATING

VO **COUNTERFLO** HEATER

ry PYROJET BURNER

From top to bottom, the NEW Dravo *Counterflo* is built around a completely new concept of burning fuel to produce efficient space heating. The heart of the new heater is the PYROJET burner—the first burner specifically designed for use in direct-fired space heaters. The PYROJET is an exclusive development of Dravo research. Here are a few of the many features of the all-new Dravo:

NEW discharge plenum distributes heat at high velocity without annoying drafts. New design cuts air flow resistance, steps up heater efficiency.

NEW induced draft fan adds to safety by maintaining high negative pressure in combustion chamber, assures accurate flow of combustion air. Positive acting vacuum switch must be closed for burner to operate.

NEW economizer tubes provide high heat transfer to air stream. New location saves space, adds efficiency. Aluminized steel construction for long life.

NEW stainless steel combustion chamber —guaranteed for 10 years—presents perfect airfoil shape to moving airstream. Resistance to airflow is lowered, and heat transfer efficiency raised. Large sizes ribbed to add strength—channel higher air-flow.

NEW PYROJET dual fuel burner—Designed specifically for the New Dravo *Counterflo*, this revolutionary burner offers many features (see box at right) including ability to burn thick No. 5 oil successfully, and automatic switchover from gas to light oil.

NEW low horsepower fans—horsepower requirements in the New Dravo *Counterflo* have been reduced. Forwardly curved, slow-speed, double inlet fans move air efficiently with air/heat ratios of 12,500 cfm to 16,000 cfm per 1,000,000 btu/hr output.

COMPLETE RANGE OF SIZES—from 250,000 to 2,000,000 btu—nine models to suit every type of building—plants, warehouses, schools, offices.

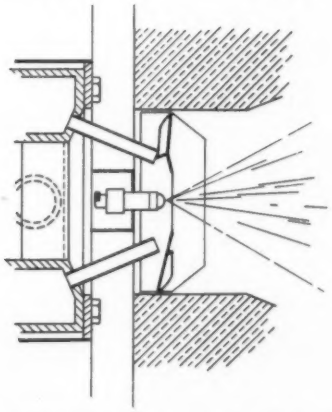
VERSATILE INSTALLATION—can be floor mounted, suspended horizontally or inverted. Adapts readily to use with ductwork if desired.

MAXIMUM SAFETY—completely new electrical system adds to safety, speeds inspection and maintenance. Extremely simple to hook up, or to add additional controls.

NEW DRAVO

PYROJET **BURNER**

"Ring and Finger" design



First burner designed specifically for direct-fired space heater, the PYROJET burns oil, gas or heavy oil efficiently in any position.

- Special air-atomizing nozzle *burns heavy No. 5 oil with high efficiency*. Dravo-designed "V-heater" assures quick, smooth starts.
- Provides instant heat.
- Automatically switches from gas to light oil during operation.
- Burner design keeps oil from fouling gas burner.

ATING AND VENTILATING SHOW • *Chicago* • *February 25-28*

or ask your nearest Dravo representative (see list on back) for details

Intensive research developed the many new features of the Dravo Counterflo heater

The new Dravo *Counterflo* heater, with the revolutionary PYROJET burner, is the result of several years of intensive research. It is easy to install, operate and maintain, and will give you many years of safe, efficient heating.

Ask the Dravo representative nearest you. He will be happy to show you how the new Dravo *Counterflo* heater can save you money.

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Before you take the first step in planning your next overhead-crane purchase, you owe it to yourself and your firm to protect that "big-ticket" *lifetime* investment by reading this booklet, "How to Evaluate Crane Bids." Don't wait until the specifications are drawn up. Accurate guidance from the first planning stages will help insure the best return from your crane investment.

Harnischfeger, leader in overhead cranes, offers an unmatched source of background and experience in helping you choose a crane installation — with no obligation, of course. P&H have pioneered every major crane advancement . . . including Magnetorque, for precision control, and now the new Electronic "stepless" crane control for the ultimate in smooth, precise performance.

Send for this free booklet, now. Write Dept. 101C Industrial Division, Harnischfeger Corp., Milwaukee 46, Wisconsin.

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PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Inspecting Adhesive Bond

SMALL BRASS gear and an electric guitar pick-up with an amplifying system have proved useful in inspecting the bond of honeycomb materials.

In the construction of some jet assemblies, thin ribbons of aluminum in the form of honeycomb are sandwiched between two layers of metal skins. The core and the skins are bonded with adhesives, to form a strong, lightweight material. One such assembly from each shipment is torn down in the laboratory for visual inspection of quality, but a non-destructive test must be made on each piece of honeycomb material.

Many methods of non-destructive testing of the bond have been tried, including the use of x-rays, but an elementary system, tapping the surface of the bond with a coin, is still an approved method. In this method, a change in sound produced while tapping the total surface area, indicates lack of bond.

Convinced that sonic testing was the best method to use, our engineers attached a gear and an electric pick-up to a handle and wired the pick-up to an amplifier. Running the teeth of the gear over the surface of the skin is in effect a tapping method which has been speeded up. The amplified sound

Gear wheel is moved over honeycomb bond. "Tapping" sounds, indicating quality of bond, are easily amplified

is transmitted to the operator by either speakers or earphones. *From the Beechcrafter, published by Beech Aircraft Corp., Wichita, Kansas.*

Hints on Ultrasonic Soldering

IN SOLDERING, it is sometimes difficult to remove the thin layer of metallic oxide which forms naturally on the surface in air and prevents the solder reaching it. Chemical fluxes are effective in many cases but this is not the case with aluminum. If ultrasonic soldering equipment is used to communicate intense ultrasonic vibrations to the molten solder in contact with the metal, cavitation in the solder will erode away the oxide skin, allowing the solder to reach and combine with the metal surface.

Here's how obtain the best results with an ultrasonic soldering iron:

1. Make certain that the area to be worked is absolutely clean. Grease is particularly detrimental.
2. Remember that flux must not be used with this method.
3. Do not trap oil or grease, or anything which will give off a vapor, within the work.
4. Make sure that there is sufficient molten solder on the bit—it is this which carries the ultrasonic energy to the metal being worked.
5. Use pre-heating on large jobs, or for speed on small ones—gas jet, hot plate or both. Remember that aluminum carries heat away faster than tin plate.
6. Always move the iron slowly over the area to be tinned. Before joining wipe off the dross which will float to the surface, using a steel scraper or glass wool.
7. Try to heat sheet metal evenly—aluminum may be permanently deformed by localized heating.

(Continued on page 40)

Concrete Deck Design Minimizes Need for Supporting Columns

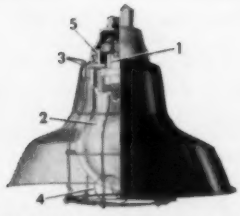
Folded plate design concrete deck on filter building receives layer of insulation

THIN-SHELL folded plate design concrete deck was used in the construction of a new filter building at the Kansas City, Mo. water works. The design has been used extensively in Europe for many years.

As in a bridge, this type of roof deck consists of a series of arches which give it structural strength. The arches also allow use of longer spans without intermediate columns or supporting beams. Fewer construction materials are required with this method than with others, resulting in a lighter-weight deck.

Over the 21,200-sq ft deck of the filter building, a four-ply asbestos felt built-up roof was applied over 1-in. rigid insulation. The insulation was mopped to the deck, but to further guard against slipping, ½-in. angle iron strips were riveted to the deck. *From Old American News, published by Old American Roofing Mills, Kansas City, Mo.*

New CROUSE-HINDS
VAPORMASTER® Lighting Fixtures



1 *Shock-absorbing receptacle* – takes jolts from any direction. 2 *Pear-shaped globe* – plenty of clearence for lamp. 3 *Vapor-tight seals throughout* – fully gasketed construction. 4 *Globe clamping spring* – flips open for re-lamping – no tools needed. 5 *Aluminum adapter-guard* – 2 sizes fit *all* Condulet bodies.

Here is vapor-tight, shockproof industrial lighting engineered for the greatest possible economy and convenience in both installation and maintenance.

In any indoor or outdoor exposure to moisture, rain, gases, dirt, or corrosive vapors . . . a new standard of operational efficiency is set by the new VaporMaster series. Cleaning and re-lamping is done in half the time, *without tools*. Whenever a demand for a change in lighting intensity develops, a simple change of adapters accommodates the larger lamp – without touching the wiring!

Hundreds of fixture combinations may be assembled from 33 standard components to meet your varying needs. Typical choices:

- *Condulet® bodies* in pendent, ceiling or bracket types and with side hubs.
- Adapters in two forms . . . one for lamps up to 150-watts A23 . . . one for 200- and 300-watts PS30 medium base lamps. Sizes may be changed without disturbing wiring merely by installing adapter for the desired lamp.

ASK FOR CATALOG INFORMATION ON THE VAPORMASTER SERIES TODAY

Just call your Crouse-Hinds distributor . . . or nearest Crouse-Hinds office.

NATIONAL ELECTRICAL Week
FEB. 10-16, 1957

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FLOODLIGHTS • CONDULETS • TRAFFIC SIGNALS • AIRPORT LIGHTING

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

8. Do not use butt joints on sheet metal unless supplementary mechanical strength is provided.

9. Cover all soldered areas, likely to be exposed to tropical or other adverse weather conditions, with a suitable protective lacquer.

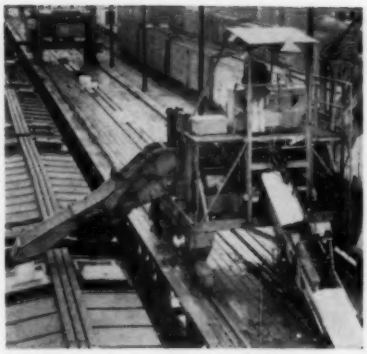
10. Use pure solder consisting of 90 per cent tin and 10 per cent zinc. Do not file the bit—the length is important. If cleanliness has been observed it should not be necessary.

11. Ultrasonic soldering is applicable to the following metals: Pure and commercial-pure aluminum; aluminum light alloys and anti-corrodal alloys up to 10 per cent magnesium; also for the fluxless soldering of copper, brass, and zinc; joining dissimilar metals together, e.g. brass or steel to aluminum; zinc base alloys when not subjected to humid conditions. *From an article in Ultrasonic News by Ralph Edwards, Technical Director, Acoustica Associates, Inc., Glenwood Landing, L.I., N.Y.*

Re-Icing Refrigerator Cars

THREE CAR ICERS accelerate the re-icing of about 1400 refrigerator cars every day during the summer months at the Blue Island, Ill. station of City Products Corp. Most of the trains re-iced at the station en route to other parts of the country, carry perishable products such as lettuce, celery, tomatoes, etc.

The icing dock can accommodate 80 cars at one time, 40 to a side. When a train is to be re-iced, 400-lb cakes of ice are brought from day storage to the dock and then to one or all three of the icing machines. These machines crush the ice to the desired size — chunk, coarse or crushed — and deliver it to the bunkers of the refrigerator cars in less than one minute. The amount of ice and salt required by each car is determined by an inspector.



Refrigerator cars are automatically re-iced at dockside in less than one minute

The dock-type icers are track mounted and self-propelled. Each is approximately 12 ft high and consists

(Continued on page 42)

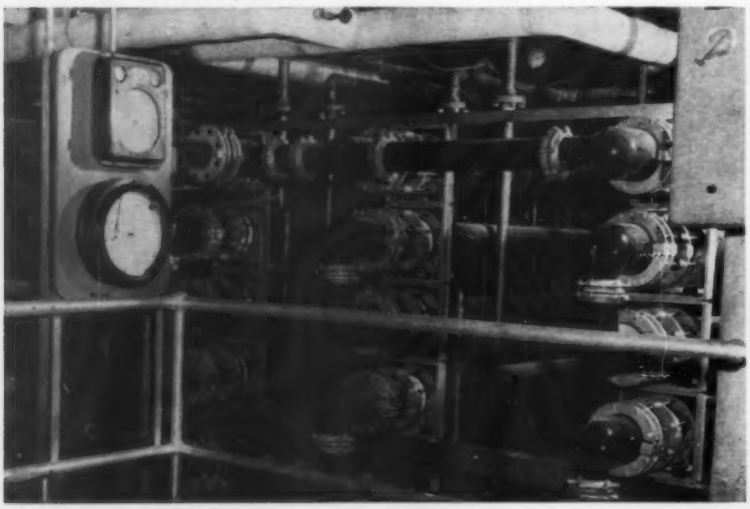
Glass Heat Exchangers Ease Boiler Load by Utilizing Heat from Dye Waste

IN ORDER TO RELIEVE the high peak loads on the boilers at the Sevier plant of the American Thread Co., an investigation was made into the various types of heat exchangers which could utilize heat from dye liquor waste to raise the temperature of incoming water. Studies were also made to determine the average temperature of the dye waste, hot water loads and boiler loads, etc.

Due to the corrosive nature of the dye waste, the only type of metal shell and tube exchanger that could be used was an all-stainless one, which was expensive. Exchangers of the open-pit type were also considered. For the quantity of waste water that was available and the amount of fresh water to be heated, the open-pit type required an extremely large and deep concrete pit which presented problems of drainage and location.

Pyrex glass heat exchangers were finally installed. They were chosen because the corrosive product comes in contact with nothing but glass, Teflon and ceramics which necessitates a minimum of maintenance.

The installation consists of 16 shell and tube exchangers, stacked four high and spaced in four groups horizontally, with the dye liquor making passes through the tubes of four units, and the fresh water making one pass through the shell of each unit. The sixteen units each has 26 tubes which can withstand a temperature of 357 F and a maximum pressure of 20 psi.

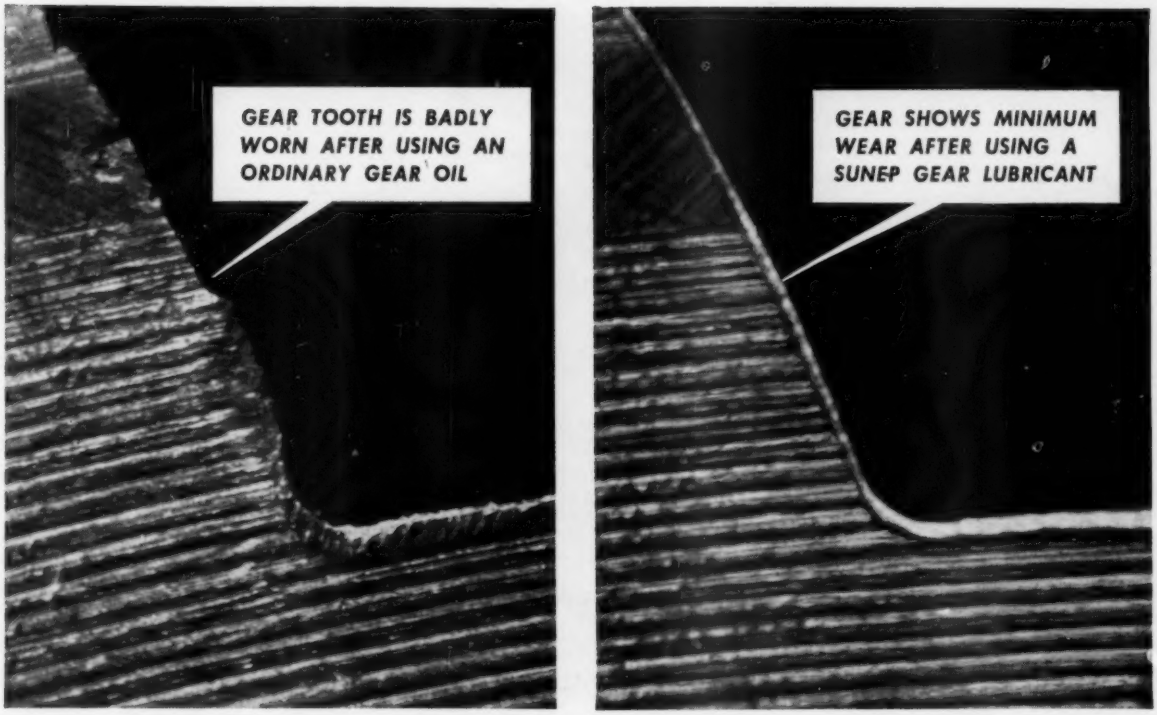


Glass heat-exchangers with instrument panel which measures water temperatures

There is a series of underfloor drain trenches in the plant large enough to install a partition down the center of each so as to provide a division between hot and cold water. This is accomplished by a special valve arrangement, devised by a member of the general engineering staff, to discard waste water below an uneconomical temperature on one side of the partition and to save the hotter waste on the other side. There, it is dammed up at a central collection point and pumped through the heat exchanger. The valve "switch-over" is actuated by a thermostat set at a predetermined temperature, thereby saving only such waste considered as economical. After the waste liquor has made its last pass through the tubes, it then flows on out through the waste trench.

After the fresh water has made its pass through the shell, it is pumped into the hot water system for processing purposes.

Based on the average annual fresh water temperature, the system was calculated to produce an average rise of 37 F, which will reduce the peak loads on the boilers as well as cut down on fuel consumption.



COMPARATIVE TESTS on identical new worm gears demonstrate superiority of Sunep Gear Lubricant. Gear on left, using a compounded cylinder oil, shows excessive wear at 70 hours. Gear on right, protected by Sunep, shows minimum wear after running over 200 hours!

HERE'S PROOF SUNEP GEAR LUBRICANTS MINIMIZE WEAR

Sunep Gear Lubricants cut power losses... protect against overloads ...lengthen gear life... reduce maintenance costs and replacements.

During recent tests gear units protected by Sunep Gear Lubricant showed an absolute minimum of wear when run at normal rated capacity. There was no indication of scoring or wear even when run at overloads up to 118%! Power consumption was reduced up to 25%. Damage from shock loads was nil.

In addition to outstanding load-carrying ability, Sunep Gear Lubricants are extremely stable, non-corrosive, prevent rusting, keep gears and bearings clean.

For complete information about how Sunep Gear Lubricants can help give longer life to your worm gear units, see your Sun representative... or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. PY-2.

SUNOCO®

INDUSTRIAL PRODUCTS DEPARTMENT

SUN OIL COMPANY PHILADELPHIA 3, PA.

IN CANADA: SUN OIL COMPANY, LTD., TORONTO AND MONTREAL

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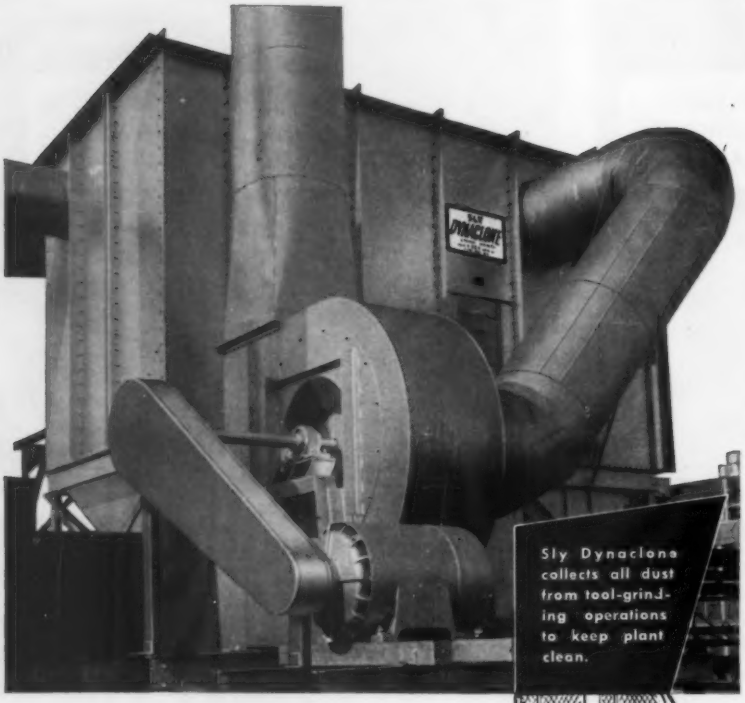


SLY
CONSTANT SUCTION
means complete dust collection

This automobile parts manufacturer has a Sly Dynaclone to vent its tool-grinding equipment for obvious reasons:

- The Dynaclone provides constant suction at dust sources. All dust is reclaimed; the plant stays clean.
- The Dynaclone is self-cleaning for continuously efficient operation. Reverse air from the main operating fan does the cleaning—there is no mechanical shaking, no auxiliary motors or blowers.
- Dynaclone design provides maximum filter cloth area in a minimum size case. Thus, a liberal amount of cloth is used to filter a given volume of air. This means efficient cleaning *plus* space-saving installation.

There are other reasons for the superiority of the Dynaclone — the *original* self-cleaning filter. *Write for Bulletin 102.*

Designers and Manufacturers of: Dust Control Systems, Industrial Ovens, Blast Cleaning Equipment, Tumbling Mills.

SINCE 1870
THE W. W. SLY MANUFACTURING CO.
4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

of a pick-up conveyor, a crushing unit, a reversible cross conveyor and two pivoted discharge chutes which deliver the ice to the bunkers. It is operated by one man, riding an elevated platform. *From a release of Link-Belt Co., Chicago, Illinois.*

Lightweight X-Ray Shielding

LEAD IS generally the lightest and most economical shielding material for x-rays because it provides the greatest protection per unit of thickness.

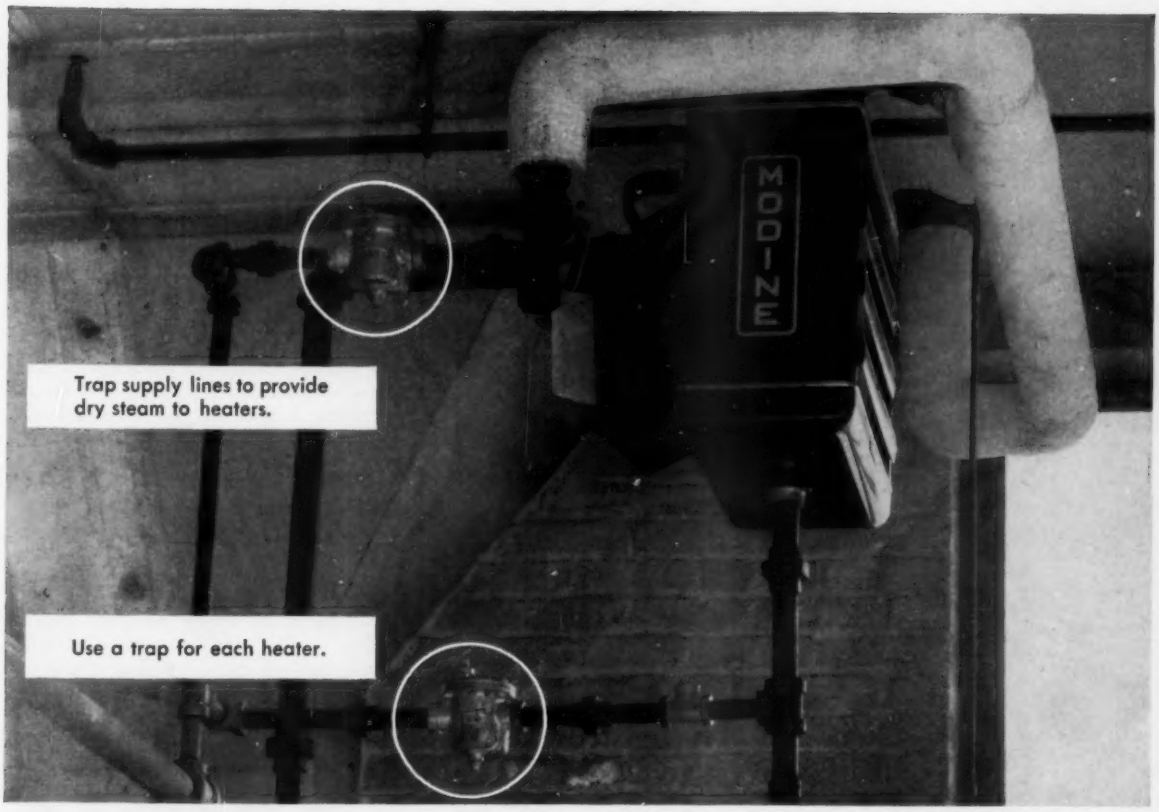
Prefabricated section, such as lead

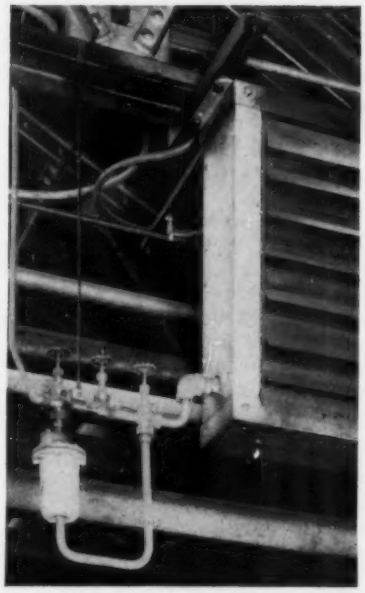
Front view of lead-shielded walls shows utility boxes piercing the lead lining

Back view of wall shows correct method of shielding. Note lapped welded seams

bonded to plywood and wallboard, or anchored in the center of concrete or gypsum blocks are some of the methods used to line rooms containing x-ray apparatus. Another method used is the fabrication of the sheet lead lining on the job site such as was done in the College of Medicine building at Ohio State University, Columbus, Ohio.

Construction involved the use of channel iron studs and horizontal steel members approximately one foot





Use a bypass above trap where heater must be kept in operation at all times. Note neat hookup possible with Armstrong vertical connection trap.

Tips on Trapping Unit Heaters for Full Output and Low Maintenance

• If unit heaters are clean and the steam supply and return lines are adequate, their performance will depend entirely upon the steam trapping. Here are some trapping pointers to insure plenty of heat when it is needed:

1. Trap supply lines to take care of condensate formed by radiation loss.

2. Use one trap for each heater. Two or more heaters drained by a single trap will fail to deliver maximum btu output.

3. Size traps properly. Many a unit heater is handicapped by a trap lacking adequate condensate and *air* handling capacity. The few dollars extra for larger traps insure fast heatup, full output and freedom from coil corrosion.

4. Install traps correctly. Put trap below and close to heater. Install a bypass around the trap if the heater must be kept in operation at all times. A shut-off valve in the discharge line facilitates trap inspection. Use of check valves and strainers is dependent upon piping conditions and the traps used.

5. Protect against PRV failure where freezing could occur. Sometimes heaters supplied with reduced pressure steam are installed where freezing could occur if traps failed to open. In this case select traps that will open at maximum steam supply pressure and still have adequate capacity at reduced pressure.

FREE ON REQUEST—COMPLETE INFORMATION on the above points, diagrams, selection data, tables and additional recommendations are contained in Armstrong Bulletin No. 2312. Also includes BTU output ratings for all models of 30 makes of unit heaters. Call your local Armstrong Factory Representative or write:

ARMSTRONG MACHINE WORKS
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STEAM TRAPS FOR EVERY REQUIREMENT — APPLICATION ENGINEERED

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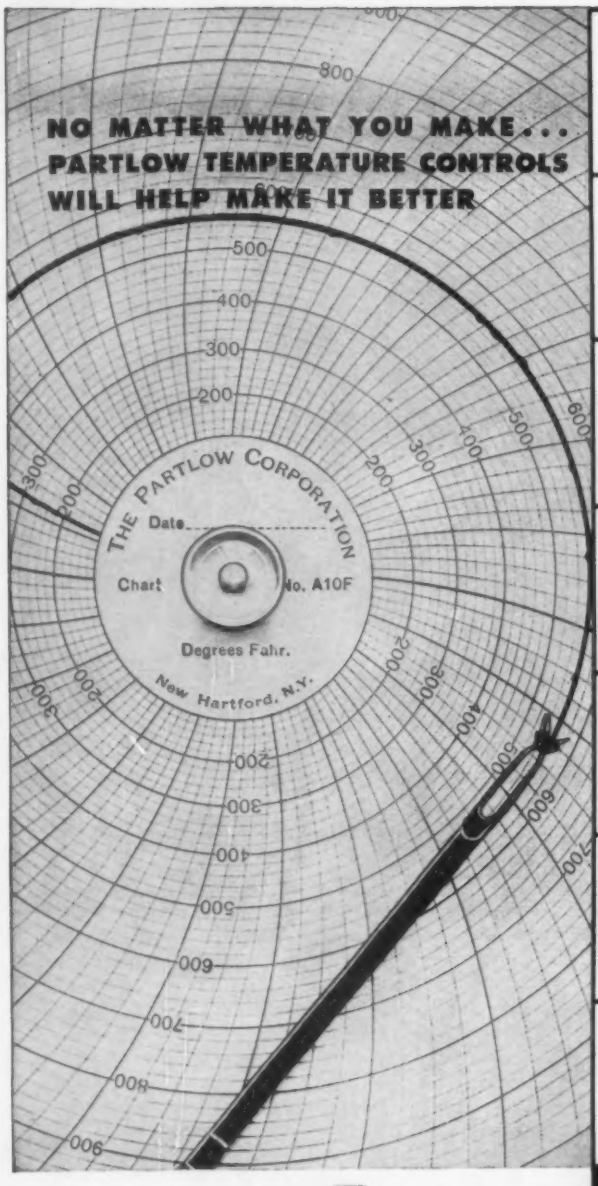

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

apart. The sheet lead, weighing 6 lb per sq ft, was applied to the steel supporting frame, starting at the bottom, with the long dimension of the sheet running horizontally. The upper edge of the lead sheet was then folded around the horizontal steel support and tack welded on the back surface.

Where intersecting vertical steel supports prevented the lead from being folded, it was left standing running parallel to the vertical steel stud.

The second course was then applied in the same manner with the upper sheet lapping the lower sheet. Joints between horizontal sheets were also lapped. It is advisable to tack solder or tack weld the laps on the face of x-ray side of the shield.

Piping, electrical conduits, switch boxes and air vents which penetrated the lead lining, were first offset as close to the outside of the lining as possible, so that they could be backed with sheet lead of sufficient size to prevent x-rays from passing through at any angle.

Holes made by screws or nails, cracks around doors or between floors and walls were also protected with lead. *From Lead, published by Lead Industries Association, New York, N. Y.*

Mechanism Eliminates Manual Handling in Metal Finishing

AN AUTOMATIC transfer unit, operating between a metalfinishing machine and a monorail conveyor, loads and unloads work racks on the same indexing sequence as the finishing machine, eliminating manual handling of parts entering or leaving the plating sequence.

The loading unit shuttles on a pair of rails, either on the floor or overhead, between the metal finishing machine and the monorail and operates in exact timing sequence with both.

After completion of plating operations, the work carrier, positioned properly at unload station, signals loader to move in. Lifting cranks, one for each lane of work, then disengage the racks, parking them on the unloader. At the same time, two racks on the adjacent loader are disengaged by similar cranks and mounted in place on the adjacent empty work carrier of the plating machine.

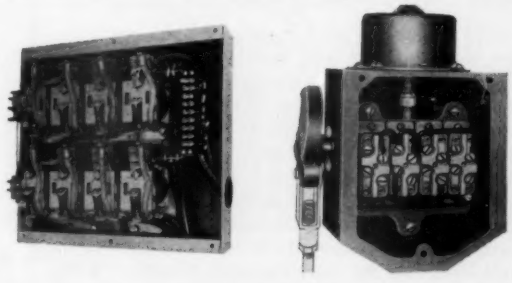
The shuttle then moves on its tracks back to the monorail. The outer lane deposits its rack on the monorail hook,

2,000 lb. Yale Electric Truck gives cartons a fast, smooth lift.

EFFICIENT YALE ELECTRIC TRUCK STACKS BOXES HIGH FOR FULL USE OF AIR-RIGHTS

This stacking operation is smooth and efficient because the Yale Electric Truck provides the operator with all the power he needs to do the job fast, with plenty of visibility for accurate load spotting and with a high lift for maximum use of air-rights. In addition, Yale's special clamp attachment eliminates the need for pallets... greatly reduces "lost storage space". Moreover, the space saved on pallet storage can now be used for other purposes.

Yale Electric Trucks will boost the efficiency and safety factor in *your* handling operation because you get dependable, high-rated performance year after year... truck- and load-stability under all load conditions... shock-resistant steering for extra handling ease in crammed quarters... and many other advantages only Yale Electric Trucks offer. Cap. from 1,000 to 150,000 lbs. For full facts write The Yale & Towne Mfg. Co., Philadelphia 15, Pa., Dept. 472.



EXCLUSIVE YALE MAGNETIC CAM-O-TACTOR controls speed changes for smooth acceleration. Magnetic contactor unit *(left)* provides uniform contact action no matter how fast driver depresses accelerator pedal. Time delay setting in master accelerating switch *(right)* prevents jumping of speeds. Precision-engineered Yale Magnetic Cam-O-Tactor assures maximum dependability with minimum maintenance through simplicity of design.

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New X-weld Chain and New Master Link give added strength, safety!

• The best has been made even better! ACCO *Registered* Sling Chains, recognized everywhere as the finest sling chains on the market, have now been made still stronger and safer by incorporating ACCO's great new Accoloy X-weld 125 chain and ACCO's new Shaped Section Master Link.

The Accoloy X-weld 125 chain is non-kinking. Each link has an oversize welded area with welds of full alloy strength. This means extra ruggedness and longer service life. Chain is identified at 5-foot intervals by tape markers reading "ACCO X-Weld Pat. No. 2763768." The new Shaped Section Master Link weighs no more, but it withstands deformation under loads up to 18% greater than a conventional round section can.

Next time you buy sling chains, get ACCO *Registered* Sling Chains—they are better than ever! For full details, call your ACCO *Registered* Distributor—or write our nearest District Office.

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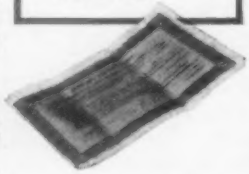

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

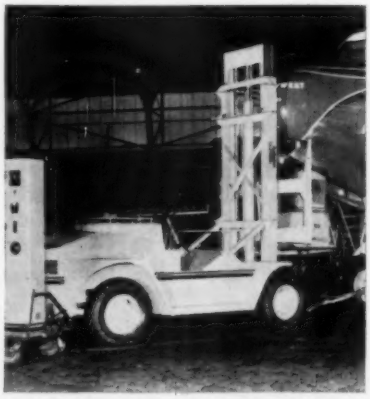
while the inner lane rack parks in a fixed pair of saddles on the unloader framework. The unloader then retracts sufficiently to pick up the second parked rack load. At the same time the monorail moves ahead one hook spacing. This signals the unloader to move ahead a second time and deposit this second load on the monorail. Simultaneously, the loader mechanism is removing two adjacent racks from the monorail. System permits use of conventional work flow patterns.

Synchronization is possible of the unload-load of two plating machines, using a common monorail, where nickel plating is done on one machine and the same rack load chrome plated on another machine. The system also serves where intermediate operations are performed on the monorail, such as degreasing, drying or rack stripping. *From a release of Hanson-Van Winkle-Munning Co., Matawan, N. J.*

Fork Truck Totes X-Ray Unit

USING a fork truck to maneuver an x-ray head into position speeds up inspection of aircraft at Northwest Orient Airlines overhaul depot in St. Paul, Minn.

The fork truck lifts the General Electric x-ray unit into positions that would ordinarily be inaccessible without disassembly of parts to be inspected or special scaffolding and provides a steady platform for the unit at any point below or around the plane. Radiographs are made of nose wheel strut pistons, prop blades, and welds in other heavy sections simply by moving the fork truck close to the plane and raising the forks until the head can be



X-ray head used for aircraft inspection is easily maneuvered on fork lift truck

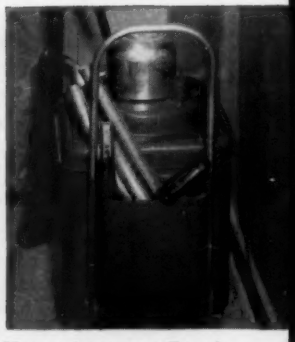
20% more cleaning power . . . and travels anywhere!

Black & Decker "95" Vacuum Cleaner is POWER-BUILT for continuous cleaning—wet or dry!

This powerful B&D "95" Vacuum Cleaner helps do your factory cleaning faster. It has up to 20% more cleaning power than *any* comparable unit—moves 75 cubic feet of air a minute. Its 1¼ hp motor has plenty of guts for both wet and dry cleaning.

Completely mobile. Reaches tough-to-get-at spots. "95" has capacity of 1½ bushels of dirt or 13 gallons of liquid. Steel tank will stand up under constant, heavy-duty use. For a free demonstration, call your distributor today. THE BLACK & DECKER MFG. CO., Dept. 1502, Towson 4, Md. (In Canada: 80-86 Fleet St., E., Toronto 2, Ont.)

ACCORDION-TYPE HOSE! Extends to 15 feet. Tough, durable—can even be used to pull cleaner. Sucks in bolts, nuts, without harm.



HANDY ACCESSORY RACK! Carries all the attachments you need to do the job. Attached to handle, it can be removed easily.

VERSATILE—18½" THIN! Compact enough to fit through narrowest of passageways. Completely mobile. Big rubber casters roll easily over rough floors.

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THERE'S NO TIME LOST on a construction fastening job with the Remington Stud Driver. You can set up to 6 studs per minute with this powder actuated tool—every stud arrow-straight!

And here's more news: you can set *both ¼" and ⅜" diameter studs.* You have a choice of 40 styles and lengths of Remington Studs in both diameters—a choice of 22 or 32 caliber power loads. All it takes is 90 seconds to change barrels and you're ready for practically *every* fastening job—light, medium or heavy duty!

Once you see the Remington Stud Driver in action you'll be convinced that here is the easy, economical way to fasten door bucks, furring strip—any of dozens of fixtures—to steel or concrete. Why not ask your distributor for a demonstration? For more information, just mail the coupon below.

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Please send me your free booklet which shows where and how to use the cost-saving Remington Stud Driver fastening method.

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PLANT ENGINEERS' DIGEST

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aimed at the section under inspection.

The x-ray head and its oil cooler are mounted on a special dolly equipped with tang slots for the truck's forks.

When not used for carrying the x-ray equipment the truck is used for other jobs. *From a release of Clark Equipment Co., Battle Creek Mich.*

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Rare-gas tube, attached to tubing based on phenolic resins, warns operator voltage is present by glowing when touched to "live" equipment. (From Bakelite Review, published by Bakelite Co., Div. UCC Corp., New York, N. Y.)

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FOAMED PLASTIC was placed in slab expansion grooves instead of the usual asphalt-impregnated fiber board while concrete on a 10-mile long highway was curing.

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Hall Industrial Water Report

VOLUME 5 FEBRUARY 1957 NUMBER 1

Unscheduled Boiler Outages Are the Hobgoblins of Steam Plants

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Package Boilers Operate Continuously

Three shifts a day, seven days a week, for over five years, with 100 percent make-up of zeolite softened water, the two-drum package-type boiler at a chemical manufacturing plant in Pittsburgh has performed without one unscheduled outage due to water.

The boiler is a 25,000 pounds per hour unit with continuous one and one-half inch floor, wall and roof tubes. Hall engineer L. C. Bishop reports that these tubes have never had to be acid cleaned nor turbined. Plant management was immensely pleased when a recent inspection showed the tubes and drums to be virtually like new.

This record is a tribute to the careful water conditioning work done by the operating men under the guidance of Hall Laboratories.

Spring Exam No Terror At This College

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A couple of years ago the college retained Hall Laboratories to set up more satisfactory water conditions. The last time the boilers were inspected it was no longer necessary to use the knocker turbine. As a matter of fact, the cutter turbine was used only as a precautionary measure and the time spent on the job was only half that previously required.

J. A. Gregory, the Hall engineer who services the plant, points out that this job is a good example of how a Hall engineer, with the co-operation of the operating men, can clean up a bad boiler deposit problem.

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One of the boilers had been retubed and had operated with water conditions recommended by Hall since being returned to service. The second had operated about eight months without boiler water treatment and then four months with Hall recommended water conditions. A third boiler had operated for approximately eight months without treatment.

The first boiler was found to be free from scale and corrosion with just a very small amount of loose sludge in the mud drum. There was a large accumulation of loose scale in the mud drum of the second boiler, indicating that proper water conditions were resulting in removal of the scale which had been deposited when no water conditioning was practiced. The third boiler was very badly scaled and turbining was necessary to put it in shape for further operation.

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After setting up a regular chemical feeding schedule and prescribing control tests and procedures, Sullivan nursed the plant along during frequent service visits, suggesting desirable changes as treatment progressed.

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'Are we ready for automation?'"

"Two years ago I didn't know the answer when the boss asked me, 'Are we ready for automation . . . electrically?'

"As plant electrical services engineer I had to come up with the answer . . . and it was a real surprise. Much of our electric equipment was antiquated and took up a lot of valuable production space. The power supply wasn't as safe, dependable or flexible as we wanted it . . . maintenance costs were soaring.

"We had spent so much time improving manufacturing processes and methods that we had neglected electrical needs. Result . . . we weren't even up to date, let alone prepared for automation.

"Steps were taken immediately to make sure our plant was adequate electrically. Today it has more automatic equipment and work-handling devices, and is equipped for more advanced types of automation. Electrical adequacy is being designed into our new branch plant, too.

"There's no reason why you can't do the same to make your plant more efficient."

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Industry has electrical adequacy problems . . .

Surveys show that many of the nation's plants are inadequate electrically. A recent study of 42 plants in a given area revealed 88% had electrical problems that interfered with production.

These Problems Can't Wait

	Percent of Plants Inadequate — Electrically*
Inadequate transformer capacity and flexibility	42%
Questionable breaker interrupting capacity	63%
Lack of power centers	62%
Poor power factor	25%
No motor control centers	42%
No plug-in bus duct	32%
Low primary distribution voltage (below 4160 volts)	49%
Low secondary voltage (below 480 volts)	25%
Lack of network distribution systems	90%
Lack of automatic switching to maintain continuity	69%
Absence of 277-volt lighting	94%

*Based on report of survey in 156 top U.S. plants conducted by *Factory* magazine.

YOU CAN BE SURE... IF IT'S

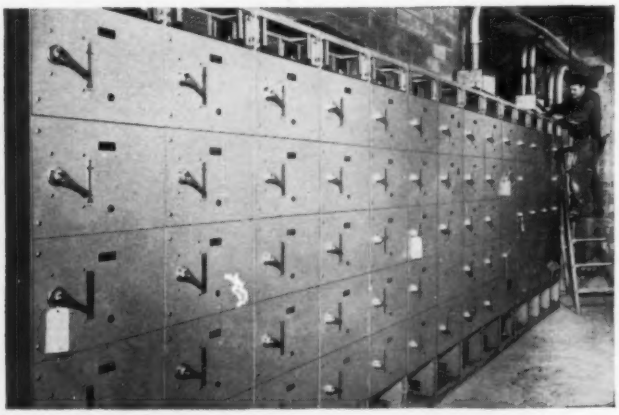
Westinghouse

"I called in Westinghouse...

We got dependable, flexible power supply for greater productivity"

Westinghouse switchgear is available in 10 basic units with a selection of standard instrument panels ... future additions or replacements can be made easily and quickly any time.

Westinghouse dry-type transformers save space, mount conveniently in out-of-the-way places. Well suited for wet, dirty or hot locations. Placement close to work load saves long, costly secondary runs.



Expansion with Westinghouse control centers frequently saves as much as 40% on installation costs over decentralized methods of mounting motor control. Inspection and service are simplified.

"When I found what some of our troubles were, I called in some expert help from Westinghouse. Working with our staff and our consulting engineers, Westinghouse further studied the condition of our plant power distribution system . . . its construction, age and state of repair.

Switchgear improved safety, operating continuity

"We installed Westinghouse low-voltage, metal-enclosed switchgear which had high interrupting capacity for safety and operating continuity. This reduced our maintenance, brought economic advantages and freedom to expand our facilities.

"Unitized switchgear reduced special design and engineering expense for our new installation, and also provided custom-built preciseness in meeting our application requirements.

Capacitors paid for themselves in 18 months

"Capacitors were carefully applied with Westinghouse help at the substation bus, on secondary bus duct, and right at the motor loads. In the first year, savings on our power bill amounted to 75% of capacitor installed cost. Capacitors paid for themselves in 18 months, and savings are still being realized.

"The capacitors reduced the burden on our feeders and released electrical capacity for other needs. We got better voltage regulation at our motor and lighting loads.

Transformers gave us power . . . where we wanted it

"Placing Westinghouse transformers strategically throughout our plant gave us power close to the load . . . conveniently, economically. Oil- and askarel-filled units were used where we needed high-impulse levels, while dry types were used when light weight, and ease of installation were key factors.

System flexibility with packaged control

"Some of our machines were subject to frequent moving, so we used Westinghouse plug-in bus duct with individual controls at each machine. For our permanent arrangements, we used control centers for simplicity in planning and installation, a high degree of safety and flexibility, centralized operation and maintenance. In both cases, we found that Westinghouse packaged control equipment simplified system design, cut our costs up to 40%.

"Why not call Westinghouse . . . like I did?"

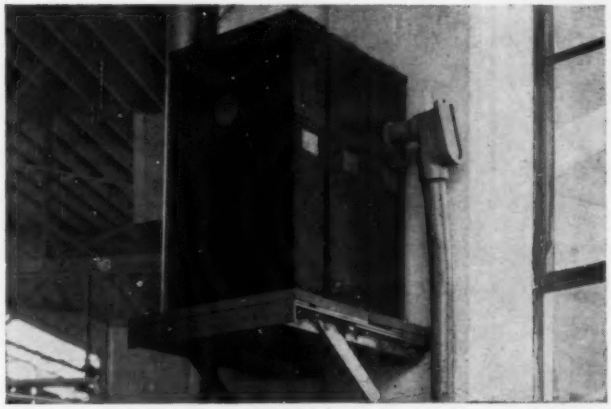
"I'm sure you'll find Westinghouse a real lifesaver in helping out with your plant power distribution systems, too. Their engineering team will gladly work with your staff and your consulting engineers. I got our plant on the road to electrical adequacy by getting in touch with my local Westinghouse representative."

For more information call your local Westinghouse sales office or send coupon. Westinghouse Electric Corporation, 3 Gateway Center, P. O. Box 868, Pittsburgh 30, Pennsylvania.

J-96100-2X

YOU CAN BE SURE... IF IT'S

Westinghouse



Westinghouse capacitors are low in initial cost, require no maintenance, save additional investment in transformer capacity. Solder-sealed porcelain bushings protect against leaks or contamination of dielectric.

Westinghouse Electric Corporation
3 Gateway Center, P. O. Box 868
Pittsburgh 30, Penna.

☐ I would like a showing of the 20-minute film, *Selecting the Right Industrial Distribution System.*

I'm interested in more information about:

☐ Switchgear ☐ Capacitors
☐ Transformers ☐ Controls

NAME_____ TITLE_____

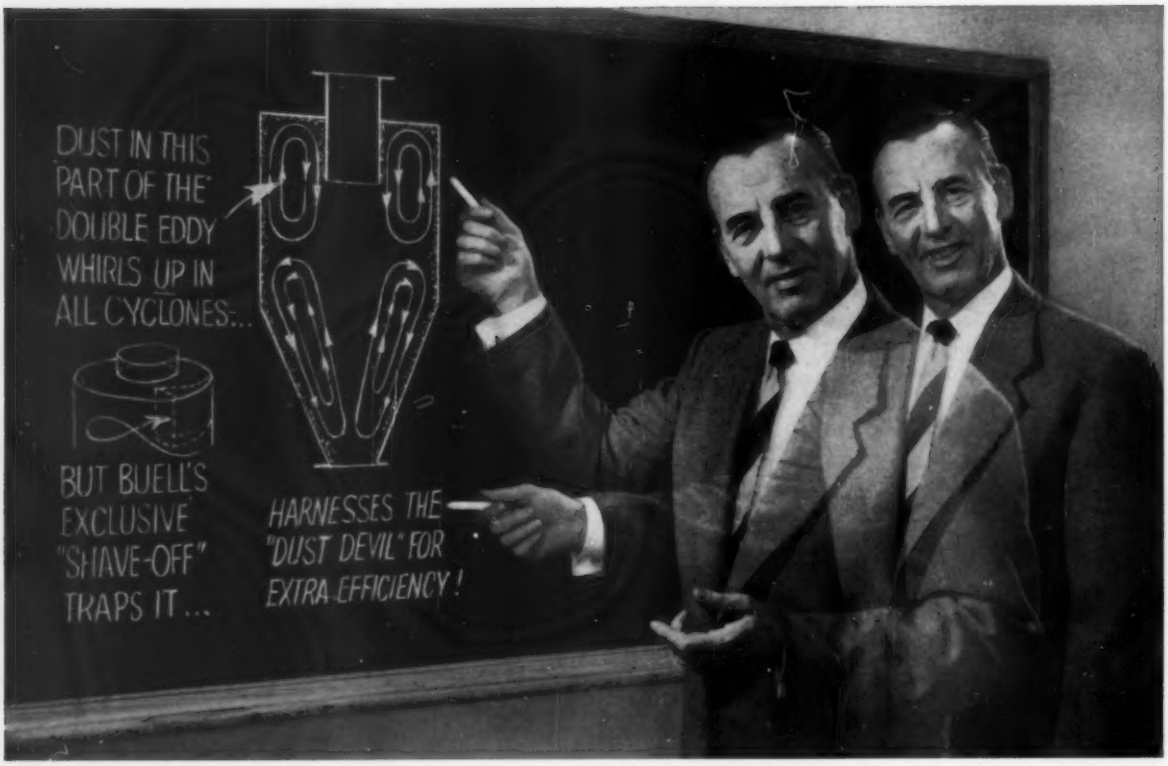
FIRM_____

ADDRESS_____

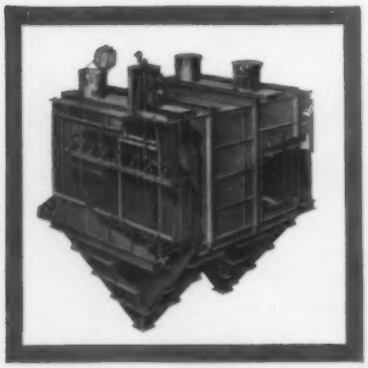
CITY_____ STATE_____

For more facts circle 540 on Reply Card

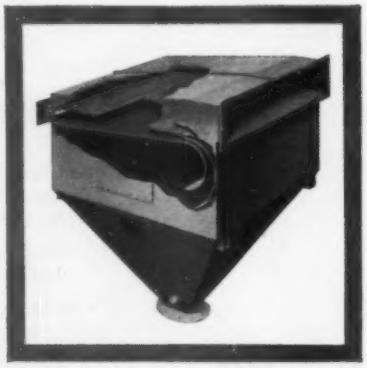
Mastering the double-eddy dust devil leads to extra dust collection efficiency!


DUST IN THIS PART OF THE DOUBLE EDDY WHIRLS UP IN ALL CYCLONES...
BUT BUELL'S EXCLUSIVE "SHAVE-OFF" TRAPS IT...
HARNESSES THE "DUST DEVIL" FOR EXTRA EFFICIENCY!

Other design features which increase efficiency include large, clog-proof diameter, proper proportioning for maximum dust separation, extra-heavy-gauge, wear-resistant construction ... features which shave dust collection costs to the minimum!



Buell SF Electric Precipitator also delivers *extra dust collection efficiency*, due to unique Spiralectrodes and Continuous Cycle Rapping.



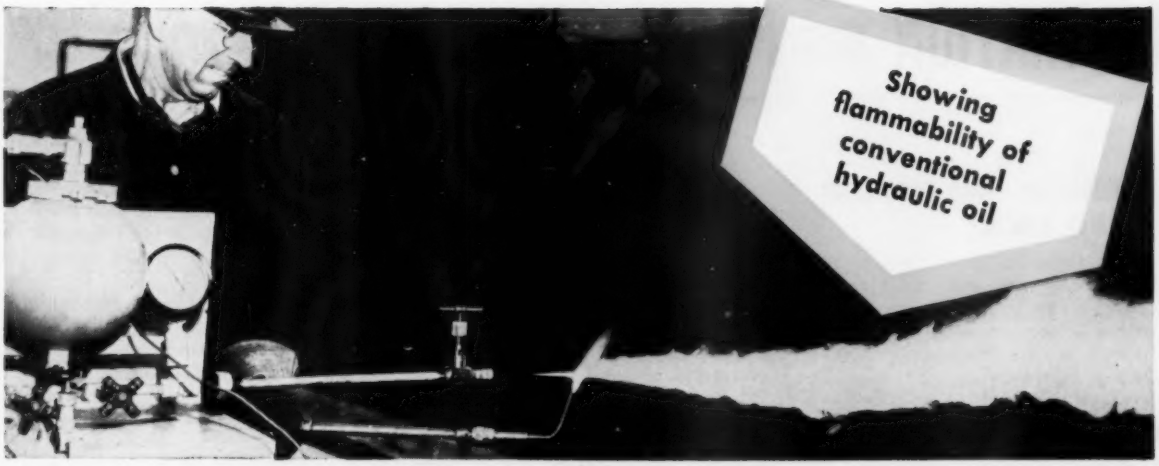
Buell Low Resistance Fly Ash Collector combines top efficiency with low draft loss, for either natural or mechanical draft installations.

For more specific data about Buell's *extra efficiency*, write Dept. 14-B, Buell Engineering Company, 70 Pine St., New York 5, N. Y.

buell®

MECHANICAL ELECTRICAL *Experts at delivering Extra Efficiency in* **DUST COLLECTION SYSTEMS**

For more facts circle 541 on Reply Card



Flame tests prove its fire-snuffing ability

SHELL IRUS FLUID 902

Entirely new formula: Shell Irus Fluid 902 is a special formulation . . . product of three years' development and field testing. It is suitable for nearly all industrial hydraulic systems, as a direct replacement for presently used oils. *Here is a fire-resistant hydraulic fluid that can be widely used.*

Non-corrosive: Shell Irus Fluid 902 contains no corrosive ingredients. It has no harmful effects on seals, fittings or bearings. It does not promote rust.

No major modification necessary . . . simply clean present fluid thoroughly out of system and replace directly with Shell Irus Fluid 902. You can use it with complete confidence. Write for test data and all information.

SHELL OIL COMPANY

50 WEST 50TH STREET, NEW YORK 20, NEW YORK
100 BUSH STREET, SAN FRANCISCO 6, CALIFORNIA

For more facts circle 542 on Reply Card

OPERATION AND PRODUCTION pointers for the industrial plant engineer

Edited by H. E. B. Anderson

Maintenance - Free Compressor For Milk Handling

OIL-FREE air from a single small compressor has enabled Harrisburg Dairies, Inc., Harrisburg, Pa., to transfer approximately 110 million pounds of milk from storage tanks to filling equipment in the last three years of operation.

This single compressor, an Ingersoll-Rand unit with a non-lubricated cylinder and 1 hp motor, required no maintenance during those three years. In this period of nearly 1100 consecutive days operation, there were no breakdowns or interruptions of service.

The compressor forces pasteurized milk, skim milk and buttermilk to their destinations at 7 psi pressure.

It is operated 10 hours a day, seven days a week the year round, and has served about 11,000 hr without failure.

Before installation of the I-R compressor, the dairy used two centrifugal pumps to move its milk within the plant.

Chief objection to the pumps was that they would tend to break up the butterfat globules and lower the cream content of the milk. Occasionally, the lines would become air bound and interrupt production.

The compressor is well suited to this single floor plant. While the compressor supplies air pressure for moving skim milk and buttermilk, its biggest job is to push the plant's pasteurized milk. Clean air enters the tops of two 1,000-gal surge tanks which are positioned just ahead of the filling equipment.

The air pressure forces the pasteurized milk out of the tanks and through overhead pipes to three bottle filling machines operating at a capacity of 265 quarts a minute. One glass bottling machine fills at a rate of 130 quarts a minute, one paper bottling unit fills 65 quarts a minute, and another paper bottling machine fills 35 half gallon containers a minute.

In addition, air from the same compressor propels skim milk a distance of approximately 100 ft from the storage vat into two 500-gal tanks in the cottage cheese department. More air from this compressor forces buttermilk from storage into a 500-gal vacuum vat.

The compressor increased the plant's filling capacity, has no ill effect on the cream, and assures that every bottle is completely full. It also eliminates the possibility, present with centrifugal pumps, that the lines will become air bound.

Pipe Repairs With Tape

Contributed by Wm. H. Nagel
Plant Engineer, Lionel Corp.

QUICK, TEMPORARY repair of a leaking pipe carrying steam, condensate, hot or cold water, can be made by wrapping electrician's friction tape around the pipe.

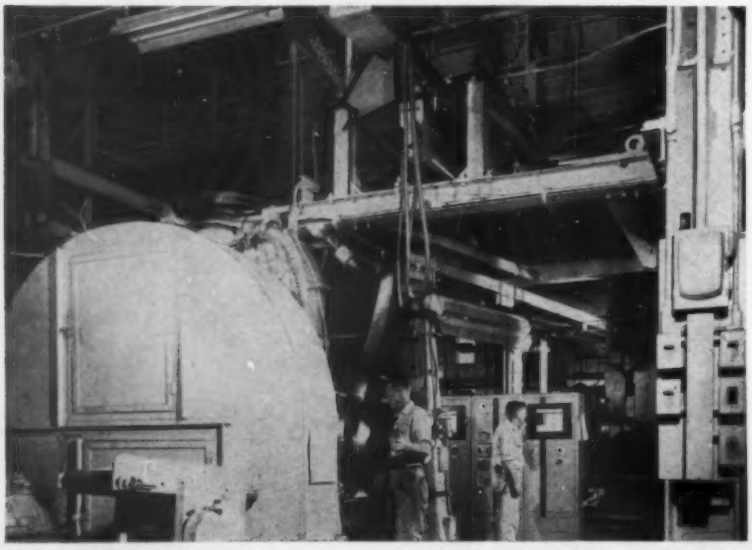
The tape should be wrapped around the pipe, over the leak, to a thickness of approximately ¼ in., then succeeding wrappings should taper off in both directions for about two inches. This

(Continued on page 58)

Beta Ray Gage Keeps Thickness of Rubber Sheeting Under Control

A BETA RAY GAGE, designed to include the latest advancements in automation and radiation gaging, is enabling the Los Angeles plant of the Goodyear Tire & Rubber Co. to control a calendering operation accurately.

The instrument, a product of Isotope Products of Buffalo, N. Y., permits tolerances of less than one per cent in the production of rubber sheeting.



Beta ray gage installation (arrow) mounted above calender stack controls position of calender rolls to maintain exact thickness in finished rubber-coated sheet

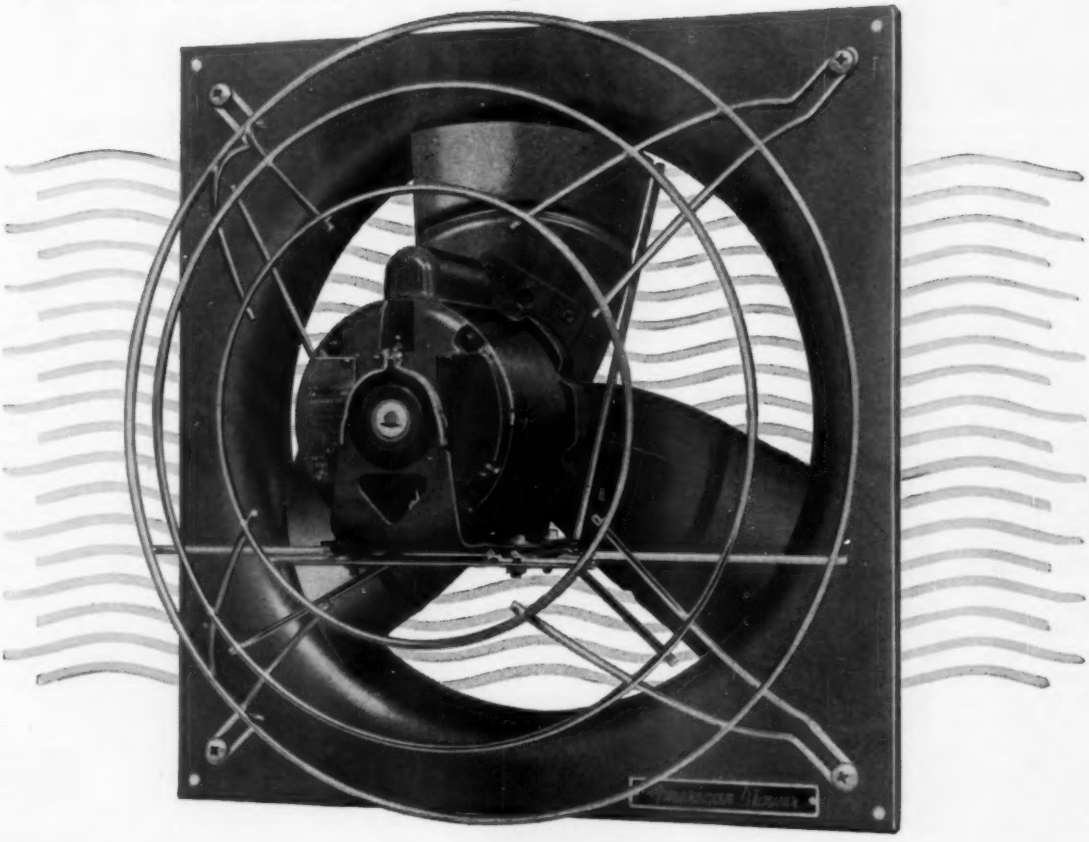
Utilizing rays given off by a radioactive material known as strontium 90, the meter basically consists of twin sets of measuring heads through which the rubber sheeting must pass during calendering. As the sheet runs between the measuring units, beta rays pass through it and are intercepted and converted into small electrical signals in proportion to the thickness of the sheet. Gaging is continuous, permitting automatic control of the calenders.

Two twin sets of measuring heads are installed in the pass line, one set after each of the tandem calenders. The sheeting, therefore, is measured after coating on either side of the fabric.

Signals from the measuring heads are fed into a floor-mounted console which activates a calender roll screwdown motor to control thickness.

The betameter is capable of controlling the thickness over a range from a half-pound per square yard up to three and one-half pounds per square yard, with an accuracy of better than one-eightieth of a pound. The rays have no effect on the rubber, nor does the rubber become radioactive.

American Blower Model G Ventura Fan



Streamline inlet gives higher efficiency, quieter operation

This is only one of many engineering and design features which make American Blower Ventura Fans a popular choice for all types of commercial and industrial applications—from cafeterias and laundries to sales rooms and warehouses.

Ventura Fans operate quietly as they whisk away stale air or fumes; have certified ratings; come in a wide range of sizes and models. Fact is: American Blower has a complete line of propeller fans—as well as blowers, attic fans, and home ventilators . . . a good reason why it pays to *standardize* on American Blower.

Why not call our nearest branch today for full information.

IT PAYS TO STANDARDIZE ON THE AMERICAN BLOWER LINE!

- **Ventura Fans** for efficient commercial and industrial ventilation; propeller type; 10 to 72 inches. Certified ratings.
- **Utility Sets** for general supply or exhaust duty. Ratings certified; self-contained. Sirocco wheels, 3 to 36 inches.
- **Aeropel Home Ventilators** for use in kitchens, bathrooms, recreation and laundry rooms. Attractive design; quiet; easy to install.
- **Attic Fans** for comfort cooling at low cost in homes, apartments, hotels. Ratings certified; vertical or horizontal models.

AMERICAN BLOWER

Division of AMERICAN-Standard

AMERICAN BLOWER DIVISION OF AMERICAN-STANDARD, DETROIT 32, MICH. • IN CANADA: CANADIAN SIROCCO PRODUCTS

For more facts circle 543 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 56)

patch will hold until a permanent repair can be made.

In one instance at our plant, a leak in a hot water pipe was temporarily repaired with friction tape, then was left until the following summer—a period of several months, before closing. Another leak, on a 70-psi steam line, was repaired temporarily during the week and then permanently repaired on a Saturday afternoon. In both instances, the temporary repair was still in good condition and could have remained for a longer period of time.

Machine "Wraps Up" Small Parts

AN AUTOMATIC packaging machine has reduced packaging costs of 0-rings by 60 per cent at the Ford Motor Co. Aircraft Engine Div. plant in Chicago.

Designed and manufactured by Product Packaging Engineering, Culver City, Calif., the machine provides a complete packaging system that will seal up to 6000 parts an hour. Small parts are sealed in individual envelopes, each printed with part and contract number, to government specifications. By enclosing each part automatically in a protective envelope, the Pak-O-Mat eliminates the costly and time-consuming hand sealing operation and protects the part against spoilage from grease, moisture or corrosion, according to Ford officials.

Parts are fed from hopper onto paper strip, then through heated sealing rolls

The unit used by Ford seals parts ranging in size from one-quarter inch to three inches. The parts feed from a hopper down a vibrating chute onto a moving strip of heat-sealable paper. An upper strip of sealing material, printed with specifications, part number and other information, joins the lower strip at the sealing rolls, where the pouch is heat-sealed on four sides and cut. The machine prints, seals, packages and cuts off automatically, and also automatically rejects empty packages. It can be used to package items such as gaskets, slip-joint nuts, bolts, bearings, gears and valves.

Blower "Squad" Fights Fumes

AN UNUSUAL-LOOKING installation of blowers is located at the Gulf Research Center, Harmarville, Pa. Eight units, made by the Peerless Electric Co., are exhausting flammable and other harmful vapors from the cleaning room of the Automotive Products Evaluation Laboratory at the Center.

In the cleaning room, each of four soaking tanks and two spray booths is equipped with its own fume exhauster. The soaking tanks are filled with solvents for loosening deposits on dirty engine parts.

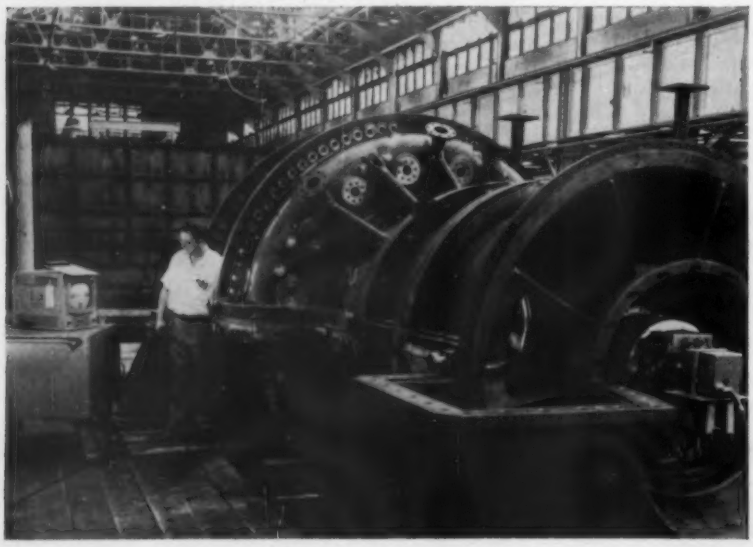
Vapor-laden air is drawn into a duct through its blower on the roof, and then discharged into the atmosphere through a vent stack rising 15 ft above the roof. A static pressure regulator in the supply air duct automatically throttles the air intake damper on the supply fan, to provide tempered air in the correct quantity to replace the exhausting air.

The complete blower and duct work system is designed to provide maximum protection from fires and explosions. An extensive fire protection system automatically sounds a warning to personnel, shuts off all supply

(Continued on page 60)

Another Use for Industrial Television—Lining Up Turbine Shells

CLOSED CIRCUIT TELEVISION is correctly and accurately positioning four- to five-ton gas turbine sections at General Electric Company's Gas Turbine Department at Schenectady, N. Y. Previously, the turbine shells were aligned by stretching a taut wire through the turbine and estimating when the shells were in position.



Television camera takes a picture down through turbine shell to align sections

Using a GE Intratel closed circuit camera when lining up the turbine shells, the camera is bolted, leveled and centered on the first, or master, shell. When another shell is to be attached, a target is centered in the new shell and the camera lens focused to the known distance to the target.

The monitor, located about 15 ft from the camera, shows where the target lies in relation to the camera lens, and enables the operator to carefully adjust the shell-connecting bolts and align the new shell.

The closed circuit TV chain, consisting of camera, cable and monitor, is equipped with a telescopic lens and was designed to operate under the rugged conditions and low light levels found in industrial plants. The monitor has 600-line resolution, which gives a clear, finely detailed picture.

How it Works!

Only new Sarco TD steam trap uses kinetic energy of steam to close valve

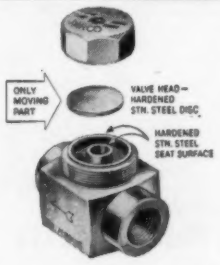
GAS MANTLES have been replaced by electric lights, steam locomotives by diesels, propeller planes by jets.

Now, the use of the kinetic energy of steam principle gives us a modern type of steam trap.

The Sarco TD obsoletes all other types for most 10 to 600 psi installations. For example, it operates without a valve closing device—no bucket, float, bellows, pins, levers or gaskets.

Glance below and you'll agree that no other steam trap is even similar to the Sarco TD!

For a trial installation—write today.



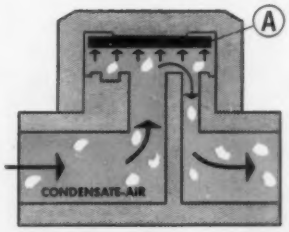
Only 3 parts... all stainless steel

Sizes ⅜ to 1"—each body is as small as a tee fitting! Capacity is determined not by a bulky body but by the effective orifice, valve action, pressure drop and condensate temperature.

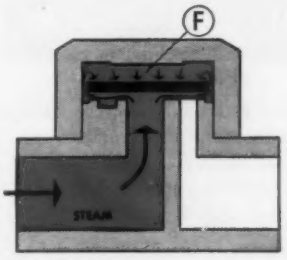
Many Advantages

1. *Practically no maintenance*—no valve mechanism, no narrow channels. Trouble-free simple design. Only 3 parts—all stainless steel.
2. *One trap for all pressures*—self-adjusting. One large capacity seat for 600 psi as for 10 psi. No changes or adjustments.
3. *Operates equally well on all loads*—on heavy, light or no condensate load. No prime to lose. No adjustments.
4. *No steam leak required*—to operate the Sarco TD. Closes tight against steam.
5. *Discharges at steam temperature and vents air* and air-steam mixtures at start-up and during operation.
6. *Freeze-proof*—when installed with outlet down, free to drain.

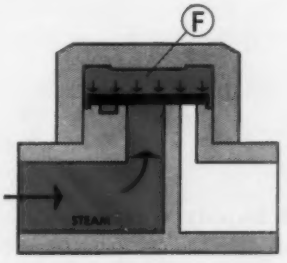
Only Sarco TD Thermodynamic Steam Trap Uses This Unique Operating Principle Which Permits Trouble-Free TD Design



1. Inlet pressure raises disc "A" from seat... immediate discharge of air and condensate at steam temperature.



2. Steam follows the condensate and the high velocity jet across the bottom of disc "A" creates a low pressure area (Bernoulli effect)... the jet is deflected into chamber "F" where it builds up pressure by recompression and this pressure acts on the top of the disc "A"...



3. Pressure in chamber "F", acting on full top area of disc "A", exceeds force of incoming steam and low pressure area under the disc... and immediately forces it down, closing the inlet. As condensation decreases the pressure in chamber "F", the disc rises and steps 1 or 2 repeat.

60-day trial convinces... No obligation... Use coupon!

SARCO

Steam Traps—Temperature Regulators—Strainers—Heating Specialties

SARCO COMPANY, INC., Empire State Bldg., New York 1, N. Y.

Please send me Sarco TD Steam Trap and strainer for 60-day trial. Size_____

For installation on_____

Name_____ Title_____

Firm_____

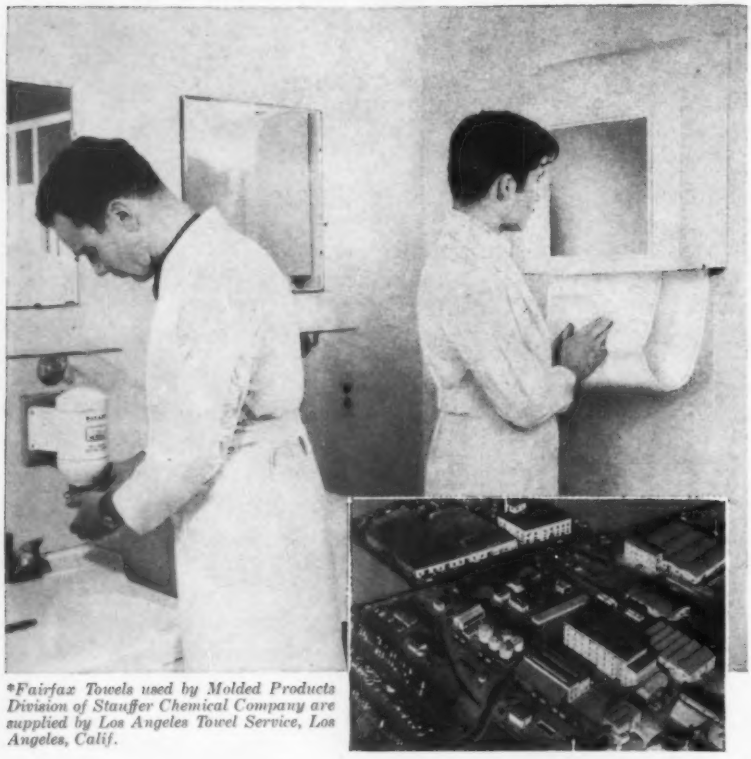
Address_____

City_____ State_____

2184-C

For more facts circle 544 on Reply Card

Stauffer finds COTTON* a smart housekeeper

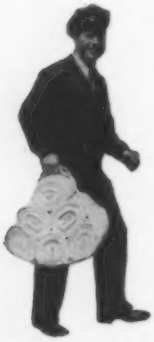


*Fairfax Towels used by Molded Products Division of Stauffer Chemical Company are supplied by Los Angeles Towel Service, Los Angeles, Calif.

• Stauffer Chemical Company's Molded Products Division makes its home in Los Angeles. There, while some 400 people work to produce hard rubber and plastic molded products, the company goes all out to keep its house in good order and provide personnel with comfortable surroundings. Cotton towels are an important part of this program.

"We had the problem of keeping locker rooms neat after each shift," reports management, "and cotton towels helped our housekeeping immensely." Along with this important neatness go reduced maintenance time and cost, reduced fire hazard, improved employee relations. Cotton takes its job seriously.

Why not follow the lead of sound management? Turn the towel job over to cotton in your office building, plant or institution. For free booklet on how cotton towel service will help you, write Fairfax, Dept. P2, 65 Worth Street, New York 13, N. Y.



Here's How Linen Supply Works . . .

You buy nothing! Your linen supply dealer furnishes everything at low service cost—cabinets, pickup and delivery, automatic supply of freshly laundered towels and uniforms. Quantities can be increased or decreased on short notice. Just look up LINEN SUPPLY or TOWEL SUPPLY in your classified telephone book.

Clean Cotton Towels . . .

Sure Sign of Good Management

Fairfax Towels WEST POINT TEXTILES

WELLINGTON SEARS CO., SELLING AGENTS, 65 WORTH STREET, NEW YORK 13

For more facts circle 545 on Reply Card

OPERATION — PRODUCTION

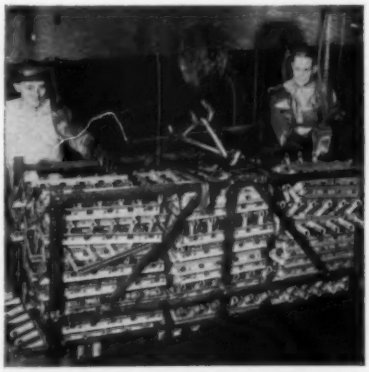
(O and P begins on page 56)

Cluster of vent stacks and blowers serves laboratory rooms in building

and exhaust blowers and sets off a carbon dioxide smothering system to kill fire. Heat-sensing elements in the laboratory rooms detect any fires that occur.

Stainless Alloy Triples Pickling Rack Life

EXHIBITING exceptional service life when exposed to 5-15 per cent sulfuric acid at temperatures up to 200 F, a specialty grade of stainless steel is being used by Line Material Co., East Stroudsburg, Pa., for their pickling



Rack of special stainless alloy carries parts during pickling and plating dips

racks and hangers. These support 1,000-lb and 2,000-lb loads of pole line hardware during pickling and galvanizing.

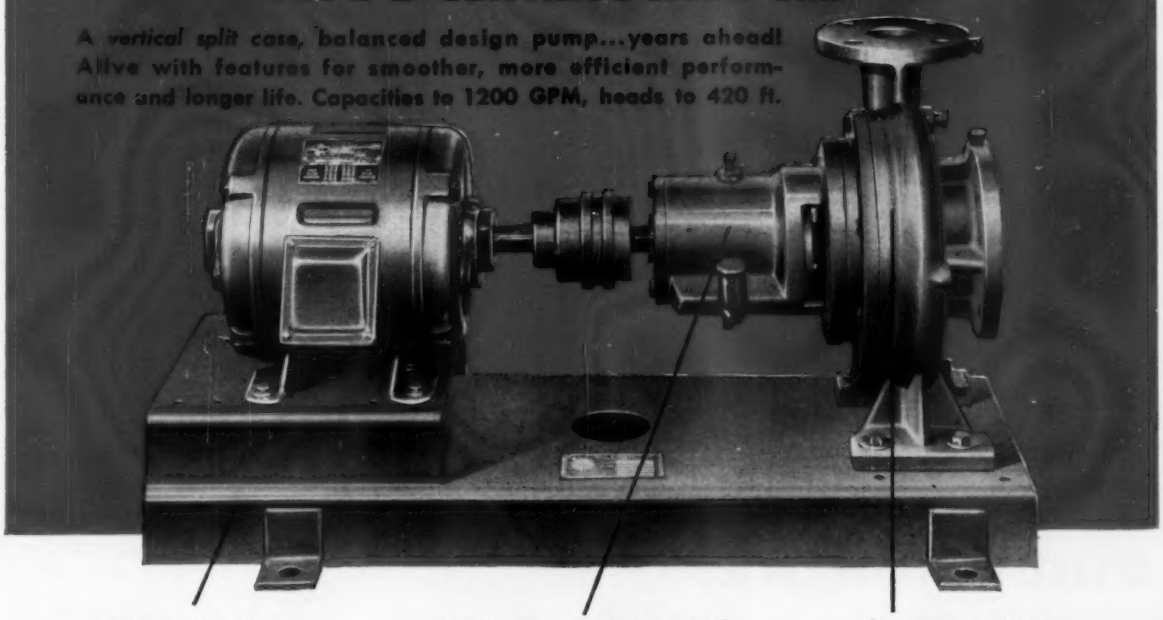
Racks formerly used, made from a 95 per cent copper alloy recommended for resistance to dilute hot and cold sulfuric acid, lasted approximately two years before corrosive wear demanded replacement.

The stainless rack, a welded framework measuring six feet by two feet

THE *NEW* B & G SERIES 1510

TYPE B CENTRIFUGAL PUMP

A *vertical split case*, balanced design pump...years ahead! Alive with features for smoother, more efficient performance and longer life. Capacities to 1200 GPM, heads to 420 ft.



RUGGED STEEL BASE

Equipped with a heavy, welded, rolled steel base, made in four different sizes to accommodate the full range of NEMA motor frames. Base mounted construction provides a sturdy platform for proper pump and motor alignment—aids in opposing piping strains applying against the pump and motor.

REMOVABLE BEARING FRAME

Truly a major advance in centrifugal pump design! The complete bearing frame assembly, with mechanical seal and impeller can be removed without disturbing piping or motor leads. Bearing frames, less the impeller, are interchangeable in all sizes of B&G Series 1510 Type B Pumps.

SOLID TYPE VOLUTE

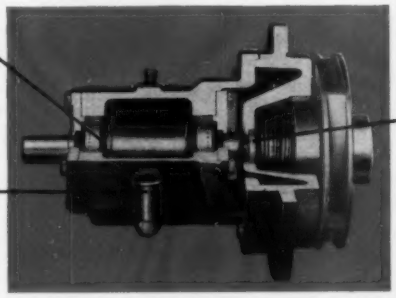
This solid based volute can be left in the pipe line when servicing the pump —offering all the advantages of horizontal split case design. Heavy cast iron construction absorbs piping strains. Openings are provided for venting and draining.

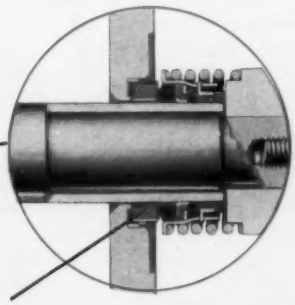
ANTI-FRICTION ROLLER BEARINGS

The B&G Series 1510-Type B Pump is equipped with Timken roller bearings to handle thrust and radial loads. This great *plus* feature assures smoother, more efficient operation.

OIL LUBRICATION

No messy, undependable grease cups —circulating oil lubrication provides positive protection to bearings. Oil level indicator permits visual check.



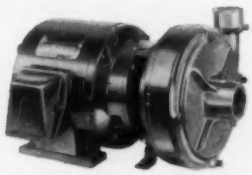


LEAK-PROOF "REMITE" SEAL

This exclusive feature eliminates the leakage which occurs with a packing gland. A carbon seal ring faces on a "Remite" floating seat—*a new material so hard it will scratch glass.* This mechanical seal is self-lubricating. A synthetic rubber bellows seals the shaft. Metal parts are steel, bronze, or stainless steel, depending upon type of service.

DYNAMICALLY BALANCED IMPELLER

Balancing chambers and pressure relief holes in the impeller reduce thrust to a minimum, lengthening pump life.



SERIES 1531 CENTRIFUGAL PUMP

Featuring vertical split case design...self-lubricating, leak-proof mechanical seal, latest NEMA motors. Super-finished shaft, oversized for minimum deflection. Impeller has balancing ring and relief holes to reduce thrust. Capacities to 1200 GPM, heads to 420 ft. Many sizes in stock.

BELL & GOSSETT
COMPANY

Dept. ER-53, **Morton Grove, Illinois**

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada

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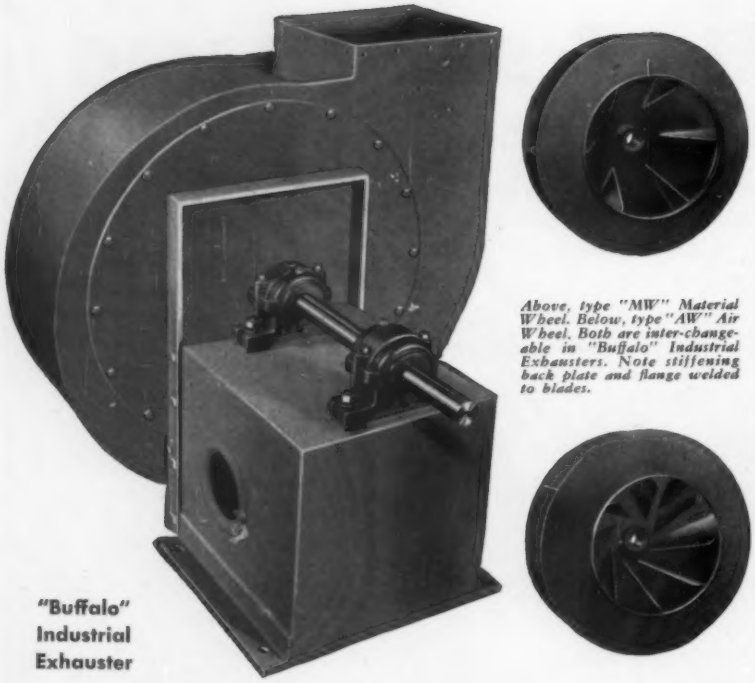


"Buffalo" Industrial Exhauster

Above, type "MW" Material Wheel. Below, type "AW" Air Wheel. Both are inter-changeable in "Buffalo" Industrial Exhausters. Note stiffening back plate and flange welded to blades.

BUILT FOR HARD WORK *at low pay!*

"Buffalo" Industrial Exhausters are built for your tough jobs — handling fumes, gases, fogs and dust, often at temperatures up to 900° F. — moving any materials a pneumatic system will carry — induced draft on small boilers — hundreds of other heavy industrial services. They're built to operate *continuously,* too, on minimum driving power and maintenance, thanks to these "Q" Factor* features built into them:

1. ALL-WELDED STEEL PLATE STRENGTH — to take punishment year after year. Oversize anti-friction bearings and shafts.
2. EFFICIENCY — thanks to smooth, air-designed housing and factory-balanced wheels, reducing friction and horsepower requirements.
3. VERSATILITY — available with interchangeable air wheels or material wheels, also heat slinger for high temperature work. Housing readily reversible or adjustable by removing bolts threaded into housing thru side plate.

WRITE FOR BULLETIN 3576 and see the characteristics built into this rugged fan to give you more work for your air dollar!

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

"Buffalo"

BUFFALO FORGE COMPANY
166 Mortimer Street Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.
Sales Representatives in all Principal Cities

INDUSTRIAL EXHAUSTERS BELTED VENT SETS PROPELLER FANS "E" BLOWERS-EXHAUSTERS

For more facts circle 547 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 56)

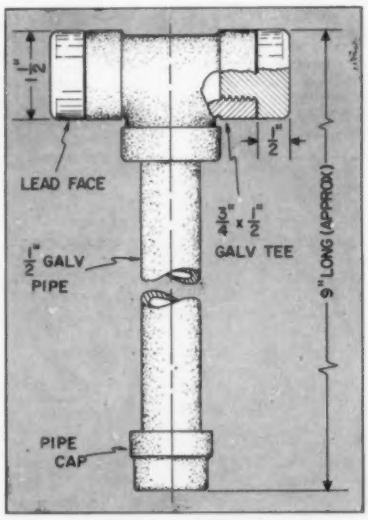
by 30 inches, was installed six years ago, the stainless hangers eight years ago. All of the stainless racks and hangers remain in service today, with indications that they will last many more years.

The special alloy, known as Carpenter Stainless No. 20, is a sulfuric acid-resisting steel. Its nickel content, fortified with high chromium and molybdenum, provides a suitable matrix to place the copper in solid solution. Performance of the steel has been so outstanding that Line Material Co. has adapted it for other parts in corrosive service, such as baskets, stirring rods and racks.

Lead-Faced Hammer

Contributed by Roy Haram
Carborundum Company

Use of replacement "faces" for lead hammers, rather than solid lead heads, has resulted in several economies in our company. As shown in the drawing, heads are molded for insertion into a standard pipe tee. They are threaded to turn into the threads of the tee.



Cutaway drawing of lead hammer shows face threaded into pipe head

With this development, a tool is available that is permanent and low in cost, since only pipe and fittings are required to fabricate the basic tool. The amount of lead in circulation in the plant is reduced, and less lead is thrown in the scrap pile when lead hammers are mutilated beyond use.

Molded faces can be made in quan-

Rust-Oleum is distinctive as your own fingerprint. Accept no substitute.

. . . goes on faster, stops rust, lasts longer over rust!

ONE MAN often does the work of two!

EASIER TO USE—because Rust-Oleum 769 Damp-Proof Red Primer goes over rusted metal after scraping and wirebrushing to remove rust scale and loose rust—usually eliminating costly surface preparations. *Stops Rust*—because Rust-Oleum's specially-processed fish oil vehicle *penetrates* rust to bare metal—driving out air and moisture that cause rust.

LASTS LONGER applied over rust—and teamed up with Rust-Oleum's many attractive finish coatings, assures lasting beauty. Try Rust-Oleum on *your* tanks, metal sash, machinery, wire fences, stacks, girders—or around *your* home. Prompt delivery from Industrial Distributor stocks. Write for illustrated literature with color charts showing colors and applications.

RUST-OLEUM CORPORATION • 2604 Oakton Street • Evanston, Illinois

RUST-OLEUM®

30% GREATER COVERAGE—MANY ATTRACTIVE COLORS

Rust-Oleum covers up to 30% more area, depending upon surface condition and porosity. And you can beautify as you protect with Rust-Oleum finish coatings in Aluminum, White, Red, Gray, Green, Blue, Yellow, Black, etc.

STOPS RUST!®

Rust-Oleum and Stops Rust are brand names and registered trademarks of the Rust-Oleum Corporation.

Write for special report showing Rust-Oleum penetration to bare metal.

For more facts circle 548 on Reply Card

BEFORE installing Chempro Lubricated Seals, the F. & M. Schaefer Brewing Co., Brooklyn, N. Y., experienced high packing and shaft replacement costs on their caustic soda pumps. Although carefully screened, minute particles of grit, aluminates from labels, and pulverized glass were carried back to the pumps. These highly abrasive particles lodged between the shaft and packing, not only chewing up the packing after a few weeks, but causing severe scoring of the shaft, necessitating frequent shaft replacement.

The first Chempro Style WLC Lubricated Seals were installed on Schaefer's caustic soda pumps in May, 1955, and have given more than 12 months of leak-free service. A Chempro Flushed and Lubricated Seal installed in December, 1955, on an Ingersoll-Rand Type 3GRVL pump has given the same trouble-free service in pumping highly abrasive caustic soda and diatomaceous earth solutions for reprocessing in a filter press.

Chempro Seals are giving highly economical service on pumps handling acids, alkalis, solvents and other chemical liquids and slurries under a wide range of operating conditions. Our engineers will be glad to recommend the Chempro Seal to meet your particular needs.

Advantages: Completely Interchangeable with Packing Simple in Design • Chemically Inert Chempro Teflon† Packing Low Power Costs • External and Internal Seals Available Arranged for Lubrication, Flushing and/or Conditioning.

Write for Seal Bulletin 551

*Patented † du Pont trademark

CHEMICAL & POWER PRODUCTS, INC.

The Original Fabricators of Teflon Packings and Gaskets

7 Broadway, New York 4, N. Y.

For more facts circle 549 on Reply Card

OPERATION—PRODUCTION

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tity for storage in the stockroom, to be issued to mechanics only upon return of a used face. And, continuous availability of smooth, square hammer faces improves the efficiency of hammer use in the plant.

Cyanide Waste Disposal

IN A RECENT Department of Commerce report, the Rock Island Arsenal presented the following comments on the disposal of cynanide wastes.

Cyanide wastes from plating, heat treating, and other industrial processes are the most commonly discharged into sewage systems and into surface streams—the toxicity of cyanide and its compounds varying with the acidity, concentration of other ions present, temperature and oxygen content.

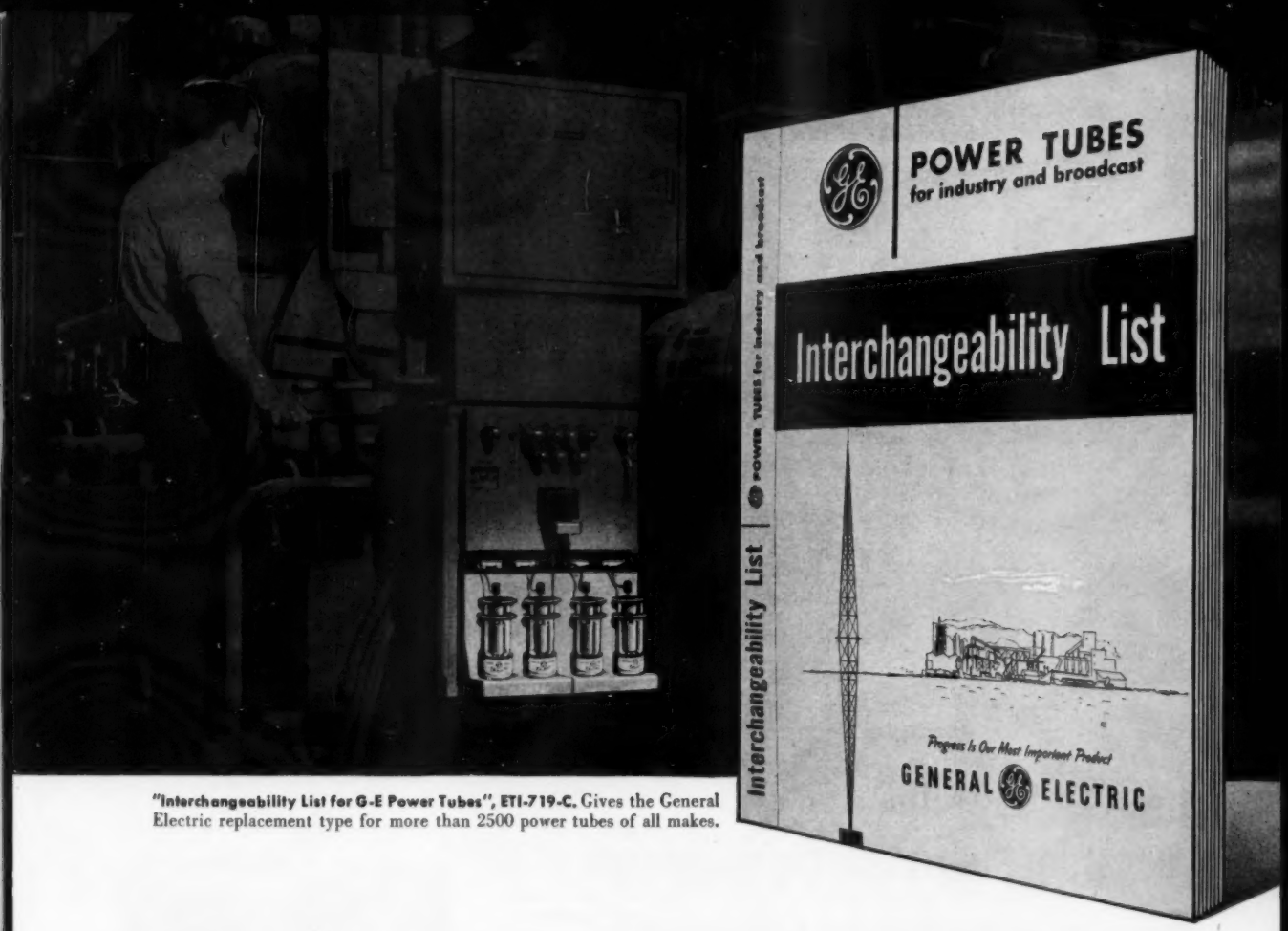
In the handling of any cyanide compound or the treatment of cyanide wastes, care should always be taken to prevent the formation of volatile hydrocyanic acid, since as little as 0.048 per cent of hydrocyanic acid in the air is immediately dangerous to life without respiratory protection. Even with oxygen mask protection, 1 per cent of this gas in the air is dangerous to human life.

However, in spite of its toxicity and its widespread use, few serious accidents have occurred.

Many different methods have been used to eliminate the cyanide in waste plating solutions. However, the best method developed has been the chlorination of the solution at a given pH. Recent work in the Wallace and Tiernan Laboratory has indicated that the addition of 3.5 to 4 parts of chlorine per part of CN in dilute solutions at pH of 8.5 results in a rapid reaction that for all practical purposes is completed within one minute, leaving at the end of this period an excess of chlorine in the form of free available chlorine. The presence of this residual at pH of 8.5 or greater signifies that the cyanide has been removed.

A second reaction between the products of this first reaction, which includes cyanates, and an additional four parts of chlorine per part of CN, will take place in about one hour. Before sufficient chlorine has been added to completely neutralize all the cyanide present, tests indicate the presence of approximately 0.50 ppm of combined available chloramine in the solution.

Chlorination under caustic conditions not only effectively eliminates the cyanide but also reduces the cop-



"Interchangeability List for G-E Power Tubes", ETI-719-C. Gives the General Electric replacement type for more than 2500 power tubes of all makes.

New G-E "Interchangeability List" helps you install quality thyratrons in every control socket!

General Electric's new Interchangeability List enables you to replace any thyratron in your plant with a long-life, high-performance G-E tube. The list indexes by type number more than 2500 power tubes of all kinds and makes. The G-E tube equivalent is given for each.

General Electric pioneered the thyratron, and G-E tubes lead consistently in advancements that give greater dependability and increased operating life.

For example, Types GL-6807, 8, and 9—three popular new G-E motor-control thyratrons—have anodes and grids that are cooled by direct thermal contact with outside air. This minimizes the possibility of tube overheating. Furthermore, the anode terminals are brazed on, won't come off from rough handling . . . and a new, special cement anchors the base firmly, gives lasting ruggedness.

Throughout General Electric's complete line of 46 thyratrons—the industry's largest—advanced features such as these help you get far longer tube life, more dependable tube performance, increased production efficiency.

Your local General Electric tube distributor will be glad to explain how you can cut production downtime by installing G-E quality in all your thyratron sockets. Phone him today! *Electronic Components Division, General Electric Company, Schenectady 5, New York.*

For replacement emergencies, make sure you have a copy of the G-E Interchangeability List. Obtain one free from your tube distributor, or mail coupon at right!

Progress Is Our Most Important Product

GENERAL ELECTRIC

161-101

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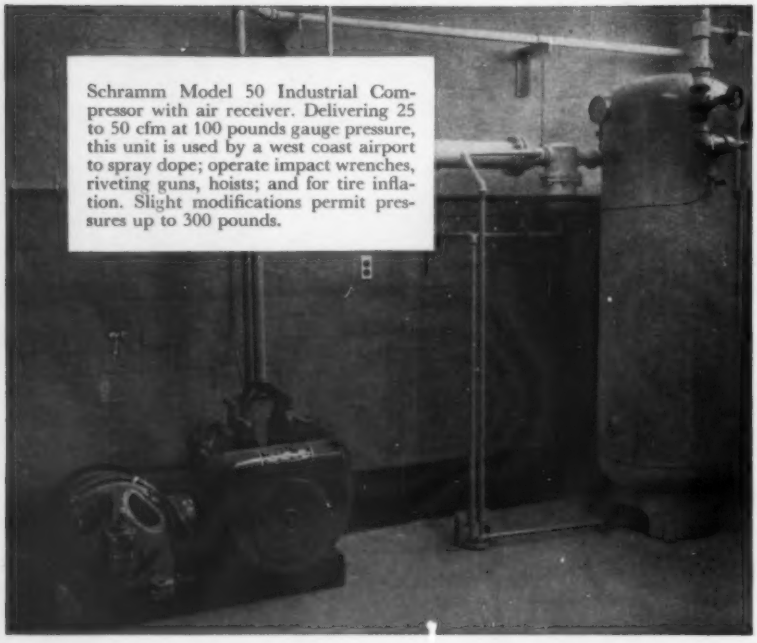
General Electric Company
Tube Sales, CART 3C
Schenectady 5, New York.

Please send "Interchangeability List for General Electric Power Tubes", ETI-719-C, to:

NAME .....

ADDRESS .....

CITY ..... STATE .....



Schramm Model 50 Industrial Compressor with air receiver. Delivering 25 to 50 cfm at 100 pounds gauge pressure, this unit is used by a west coast airport to spray dope; operate impact wrenches, riveting guns, hoists; and for tire inflation. Slight modifications permit pressures up to 300 pounds.

MAJOR INDUSTRIES DISCOVER:

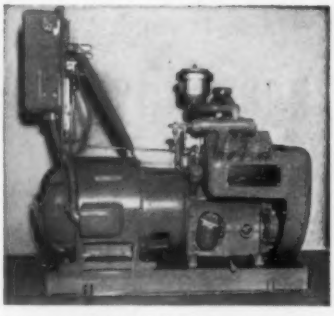
Endless uses for versatile Schramm Compressors

Wherever there's need of compressed air up to 50 cfm, you'll find Schramm Model 50 Compressors. No other industrial compressor adapts so readily to so many kinds of work. And no other compressor of its rating is more compact, dependable and economical.

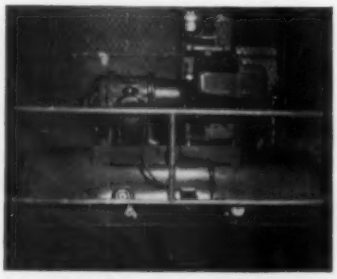
Reasons for their popularity are many. Balanced reciprocating parts eliminate vibration and make foundations unnecessary. Schramm forced-lubrication reduces wear on all moving parts. Initial cost, compared with that of others delivering the same amount of free air, is low. Maintenance is no problem—any mechanic who understands gasoline engines can service Schramm Compressors.

Schramm manufactures a complete line of compressors and accessories for industrial use. Write today for Catalogs GC-55 and 5510. No obligation.

Your local Schramm Dealer is listed in the Yellow Pages of your telephone directory.



Schramm Model 50 Compressor with direct connected motor drive and starter mounted. Schramm Compressors may be driven by any source of rotative power.



Schramm Compressor and Motor mounted on air receiver. Schramm Model 50 Compressors deliver clean, dry air. Cooling is by a Schramm-, engineered blower instead of by water.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

665 North Garfield Ave. West Chester, Pa.

For more facts circle 551 on Reply Card

OPERATION—PRODUCTION

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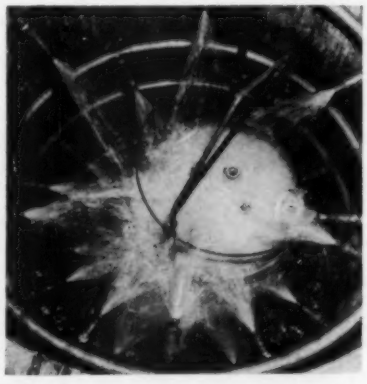
per and zinc concentration to levels sufficiently low to permit discharge of the wastes into most streams.

Other methods for the elimination of cyanide are acidification which results in HCN gas, which is very poisonous, as stated above, and the most recent method, the use of ion exchange resins. Additional chemical treatments are the use of lime-sulphur, sulphur dioxide gas, or treatment with hypochlorite or bleaching powder. The latter method is probably the most economical for a batch type method.

The copper precipitated as black copper oxide is apparently colloidal in nature and is quite difficult to filter. However, on a plant scale operation, a suitable coagulating agent could be used to precipitate the copper.

Hot Tanks Get a Shower Bath

GETTING a hot, buoyant tank under water for a quenching following heat treatment was a problem recently solved by the Manufacturing Research

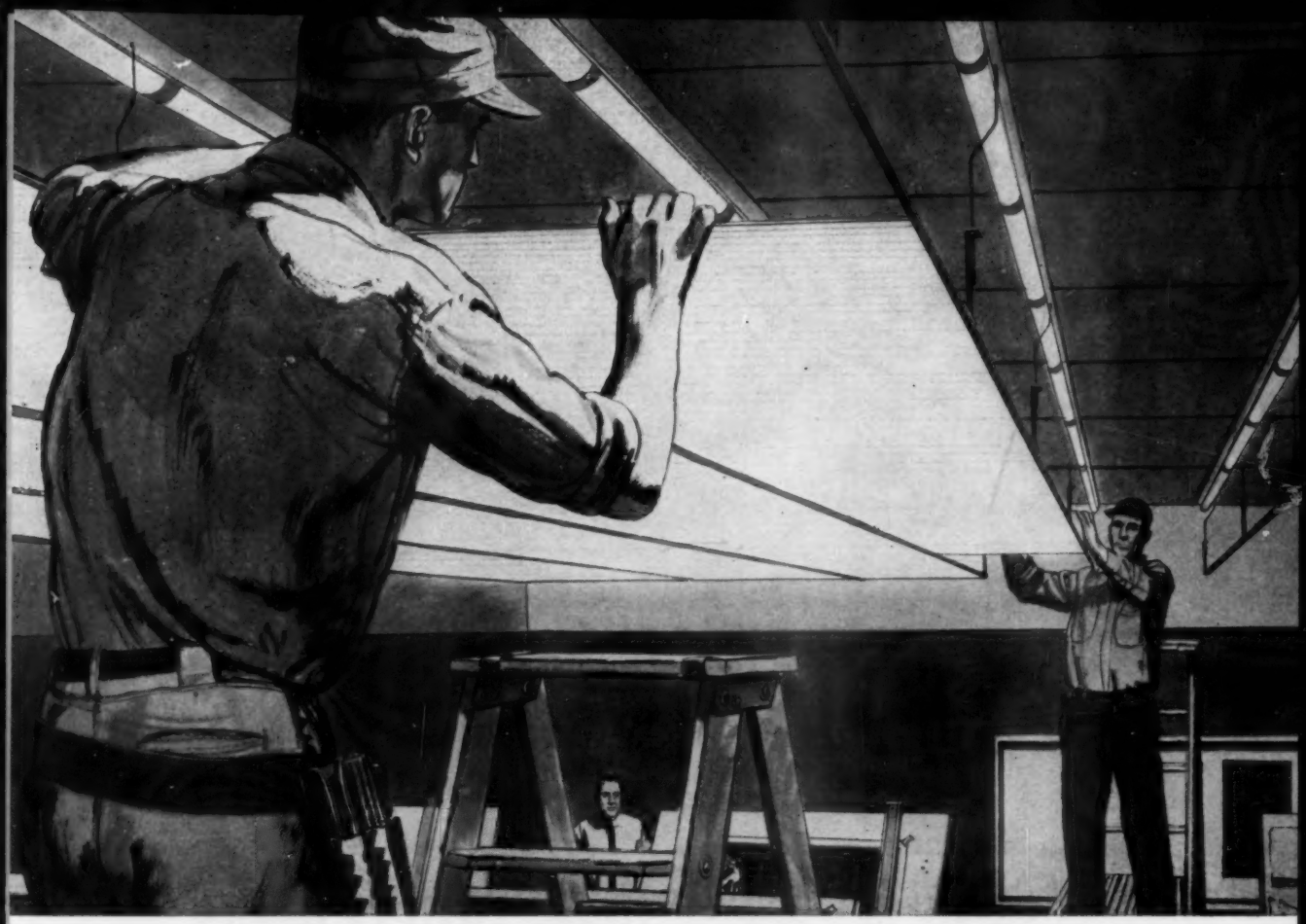


Heat-treated tank is lowered into tub where nozzles spray it with water

and Development group of the Glenn L. Martin Co., in Baltimore.

Several high-pressure tanks, of corrosion-resistant steel are included in each of Martin's earth satellite launching vehicle units, and after heat treatment at 970 F, the tanks required a quick cold quench. Natural buoyancy of the tanks prevented efficient quenching by dipping the tanks in a tub of water, so a shower bath was built.

Nozzles, attached to a circular pipe section inside a tub, form the shower heads. The hot tank is lowered into the tub, and the sprays cool it off, quickly and evenly, with no complicated submersion apparatus necessary.



Fine craftsmanship and better production stem from easy seeing and uniform illumination. Here is an important project on which Graybar, located in over 130 principal cities, can give you or your electrical contractor real help.

Your best source of

EVERYTHING IN LIGHTING

...is Graybar

Whenever you are confronted with the need for better lighting in any plant, office or warehouse area, talk with a Graybar lighting expert. For, whatever the requirements, he can give you an impartial recommendation for the best lighting system for the need – from the most complete selection of lamps and lighting units available from any one source!

The Wakefield "Magic Ceiling," illustrated above, is an example. Units arrive on the job as a complete package: fluorescent strip lighting, straps, channels, grid and diffusers. No preliminary construction is required and the Magic Ceiling can be installed practically overnight.

New lighting developments such as this are constantly being announced by the manufacturers of America's best illumination equipment whom Graybar represents. Some of these are: Benjamin, Curtis, Day Brite, Pittsburgh, Silvray, Smithcraft, Wakefield, Wheeler, and Wilson. You and your electrical contractor have direct access to this current progress in lamps and lighting equipment when you work with the nearest Graybar office. 695-322

Write Graybar for your copy of "NEW INTERIORS FOR OLD"

which shows striking transformations made within a few hours by installing the "Magic Ceiling." This new lighting source comes in stock units to fit interiors of all sizes and shapes.

CALL GraybaR **FIRST FOR** Everything Electrical GraybaR ELECTRIC COMPANY

GRAYBAR ELECTRIC COMPANY, INC., 420 LEXINGTON AVENUE, NEW YORK 17, NEW YORK, IN OVER 130 PRINCIPAL CITIES

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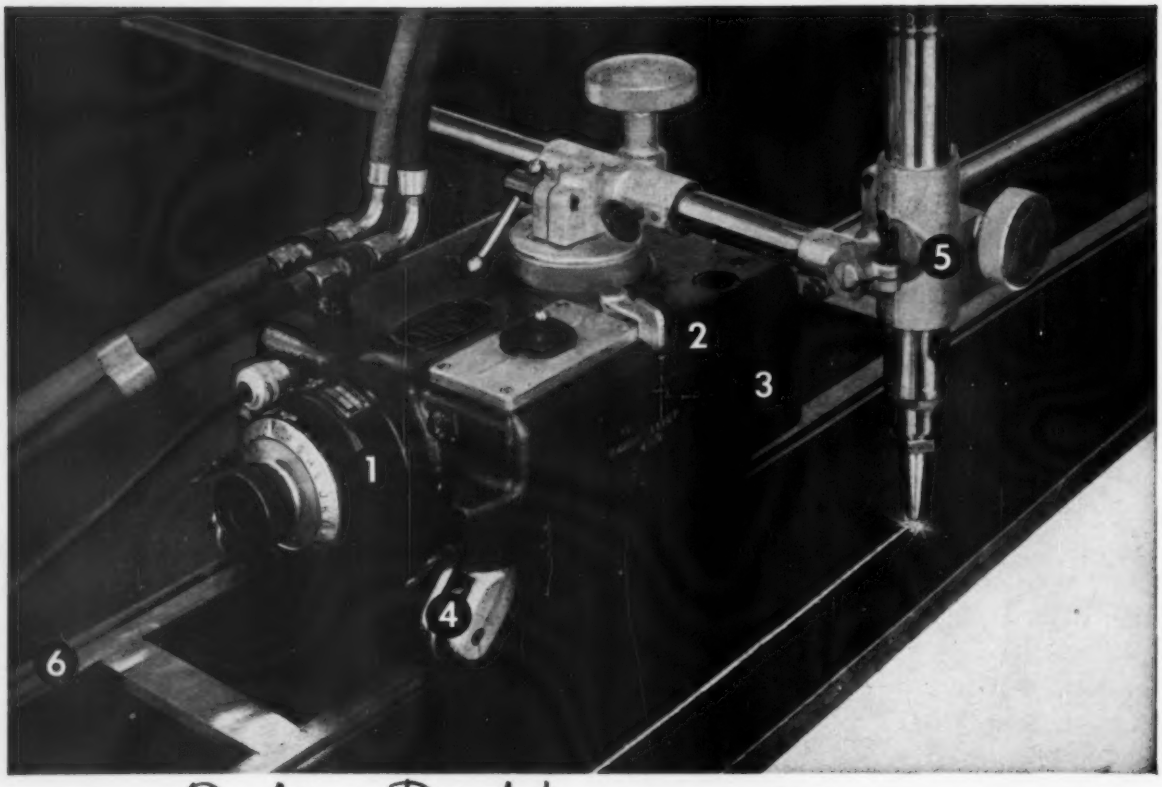

Quality in Details! these factors make the Airco #10 Radiagraph your best buy

The #10 Radiagraph is a portable (43 lb) gas cutting machine designed to cut metals up to 6" thickness. It will cut straight lines of any length, circles from 3" to 85" diameter, arcs up to a radius of 42½" – all with square or beveled edges. Designed to provide the greatest degree of cutting accuracy and convenience of operation, the husky overall construction of the #10 has made it an indispensable tool wherever steel is to be cut to size for fabrication. Here are a few of the *quality details* that don't meet the eye:

1. *Governor Control Variable Speed Motor* puts the entire speed range (4 to 50 ipm) at operator's fingertips. An indicator showing all speed settings is provided. Speed can be increased or decreased while cutting is in progress... speed is not affected by load or voltage changes.

2. *Clutch Lever* allows the machine to be rolled freely in either direction. This feature is a time-saver when aligning the machine with work.

3. *Drive Shaft* (under housing) runs on replaceable needle bearings which reduce friction to a minimum and affords a maximum of free motion.

4. *Caster Wheels* run in a machined groove in track for greater machine stability and more accurate cutting.

5. *Torch Holder Assembly* is made of brass forgings which withstand more abuse than castings and have greater corrosion resistance than iron or steel.

6. *Track* is cold rolled steel with two machined grooves in which wheels travel, and has track sections with tongue and grooved joints for correct alignment when multiple lengths are used for progressive cutting.

Airco oxyacetylene shape cutting machines include the Airco Camograph, Monograph, Duograph, Oxygraph and Travograph. Write today for literature.

AT THE FRONTIERS OF welding PROGRESS YOU'LL FIND ...

AIRCO

Offices and dealers in most principal cities

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A division of Air Reduction Company, Incorporated, New York 17, N. Y.

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Products of the divisions of Air Reduction Company, Incorporated, include: AIRCO — industrial gases, welding and cutting equipment, and acetylenic chemicals • PURECO — carbon dioxide, liquid-solid ("DRY-ICE") • OHIO — medical gases and hospital equipment • NATIONAL CARBIDE — pipeline acetylene and calcium carbide • COLTON — polyvinyl acetates, alcohols, and other synthetic resins.

For more facts circle 553 on Reply Card

MODERN STOKER-FIRED BOILERS

Despite the relatively wide extent to which oil – and gas – have come into use for firing industrial boilers, the fact remains that coal continues to be the most economical fuel available in many areas.

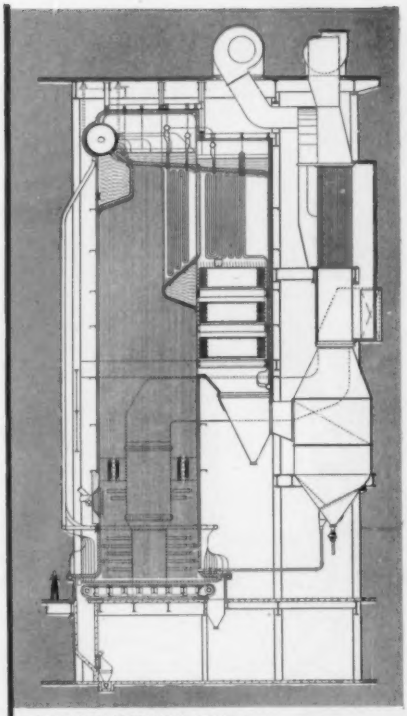
Moreover many potential coal users are unaware of the tremendous improvements that have been made in recent years in the design and general effectiveness of mechanical stokers. Here at Combustion virtually the entire stoker line has had extensive design changes, all directed at improved performance. But overall performance is tied in inescapably with boiler performance. At Combustion you have the important advantage of dealing with a leading boiler manufacturer that also offers the most complete line of stokers available anywhere. You are assured, therefore, of a completely coordinated design comprising stoker, boiler, furnace and – if desired – heat recovery equipment and/or auxiliaries, all engineered specifically for your particular requirements.

Displayed below are three – of the many – C-E stoker-fired boiler designs which, collectively, are suitable for any coal-firing conditions.

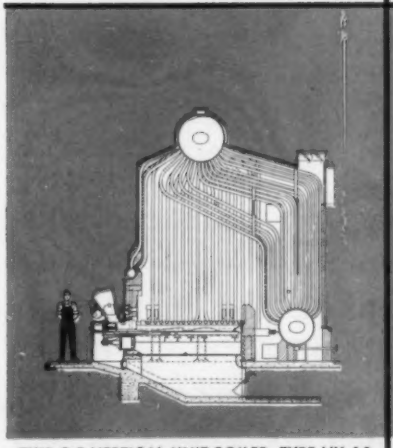
At the right is illustrated the latest – and largest – example of the C-E Bark-burning Unit, a design pioneered by Combustion and now widely used for burning bark, hogged-wood and other waste wood fuels.

So – when you are in the market for coal or other solid-fuel-burning units it will certainly be to your advantage to find out what Combustion Engineering has to offer. Our engineers will be glad to discuss your needs with you or your consultants.

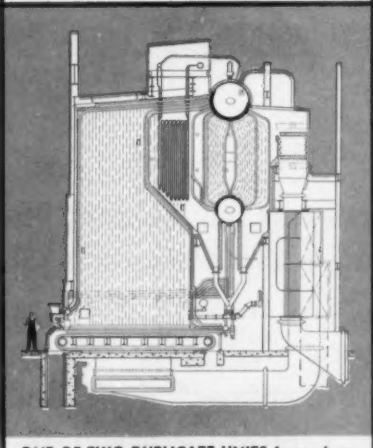
B-892A



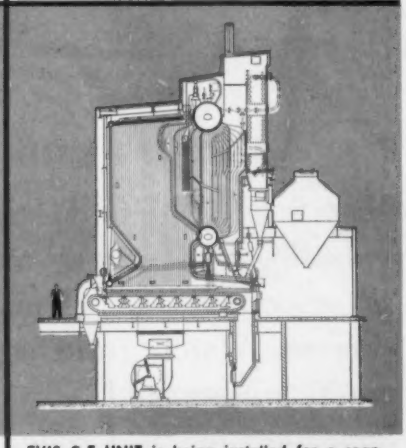
C-E BARK-BURNING UNIT for a paper company. This is a very large unit; capacity – 450,000 lb steam per hr, operating pressure – 1335 psig; total steam temperature – 958 F. It is designed to burn bark, natural gas, oil or any combination thereof. These units are in service for capacities as low as 20,000 lb of steam per hr.



THIS C-E VERTICAL-UNIT BOILER, TYPE VU-10 fired by a C-E Underfeed Stoker, Type E is for a dairy. Capacity is 30,000 lb steam per hr at 150 psig. VU-10 Boilers are available for capacities from 10,000 to 60,000 lb of steam per hr. They are often equipped with C-E Spreader Stokers, dump grate type.



ONE OF TWO DUPLICATE UNITS for a chemical company comprising C-E Vertical-Unit Boilers, Type VU-40 fired by C-E Spreader Stokers, continuous discharge type. These are baffleless boilers designed for a capacity of 150,000 lb steam per hr at 900 psig and 808 F. Coal is Eastern Bituminous.



THIS C-E UNIT is being installed for a soap company. It comprises a C-E Vertical-Unit Boiler, Type VU-50 fired by a C-E Traveling Grate Stoker. Coal used is Midwest Bituminous. This boiler is designed for a capacity of 100,000 lb steam per hr at 850 psig and 585 F. It is an outdoor type unit.

COMBUSTION ENGINEERING

Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y.

CANADA: COMBUSTION ENGINEERING—SUPERHEATER LTD.

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; DOMESTIC WATER HEATERS; SOIL PIPE

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Photo through courtesy of Eaton Manufacturing Co.

MASS PRODUCTION means mass handling . . . and no other handling system can match the **Powell Flowmatic*** when it comes to smoothly and efficiently moving volume parts and materials in process. Watch it in action . . . talk with those using it and you'll understand why Flowmatic* is called the *"hottest thing in handling in a decade."* Literature upon request.

*Patent: No. 2762529

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POWELL PRESSED STEEL SINCE 1920

POWELL *flow-mation** SYSTEMS

The Powell Pressed Steel Co. Hubbard, Ohio

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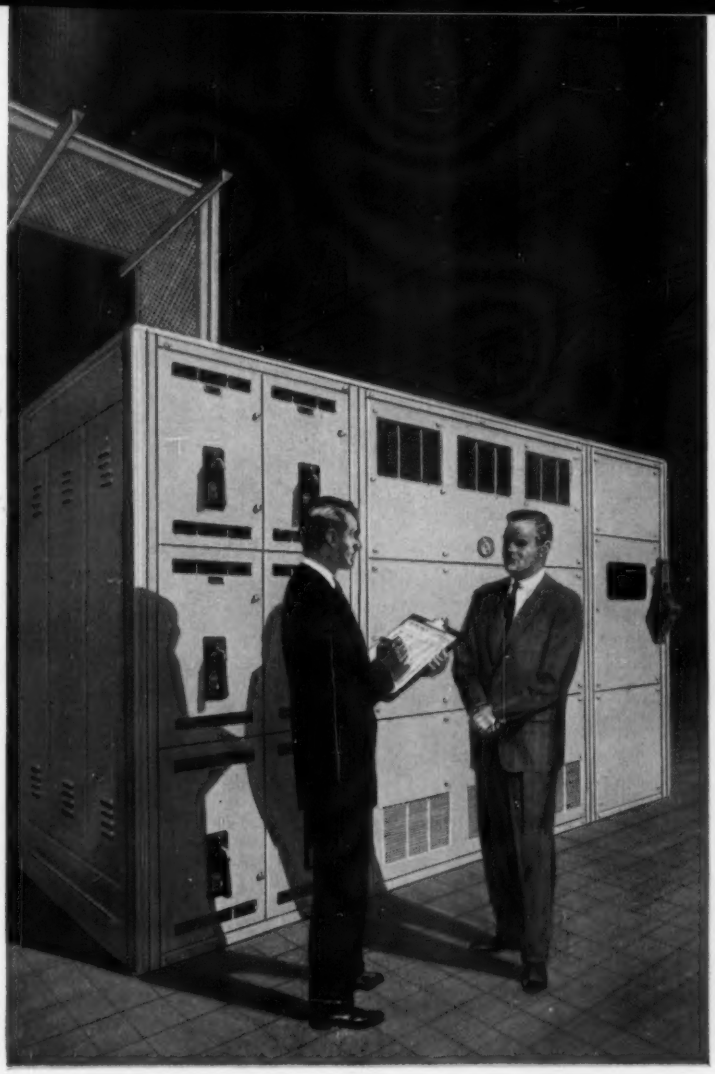

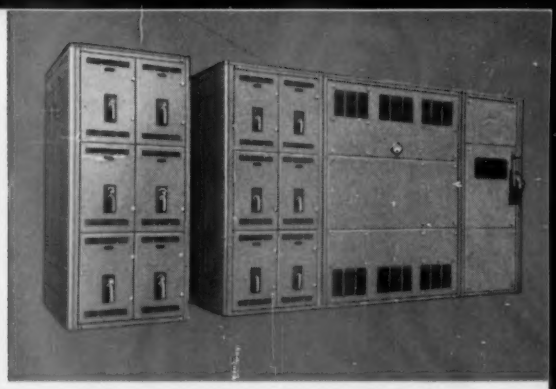

Standardized construction of BullDog Unit Substations allows for easy expansion. Units are interchangeable. Changes and additions can be made quickly and economically. The substations are of the secondary type . . . rated up to 600 volts . . . and are available with all types of transformer equipment.

BullDog field engineers offer specialized help in preparing a system tailored to your present and future power needs. They have the knowledge and experience to co-ordinate top-quality, creatively engineered BullDog products into an integrated, efficient electrical system that stays modern.

Plan your power for production results!

New BullDog secondary Unit Substations answer vital needs in the operation of modern industrial plants. They bring the overall economies of high-voltage distribution—plus providing adequate facilities for future expansion. And by bringing higher voltages closer to consuming equipment, Unit Substations boost machine efficiency to maximum productivity. Valuable floor space is saved, too, through an integrated unit which houses transformer, switchgear and other components.

Let the BullDog field engineer give you all the facts—show you how Unit Substations are the starting point of a *planned* power system by BullDog, which adds materially to plant safety, economy, and production efficiency!

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BullDog Electric Products Company, Detroit 32, Michigan • A Division of I-T-E Circuit Breaker Company • *Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada), Limited, 80 Clayson Rd., Toronto 15, Ont.

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BULLDOG

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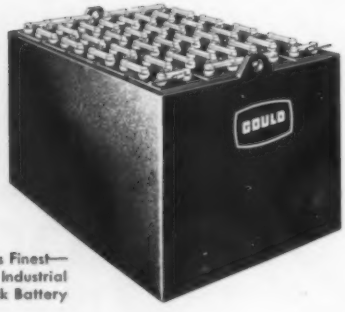

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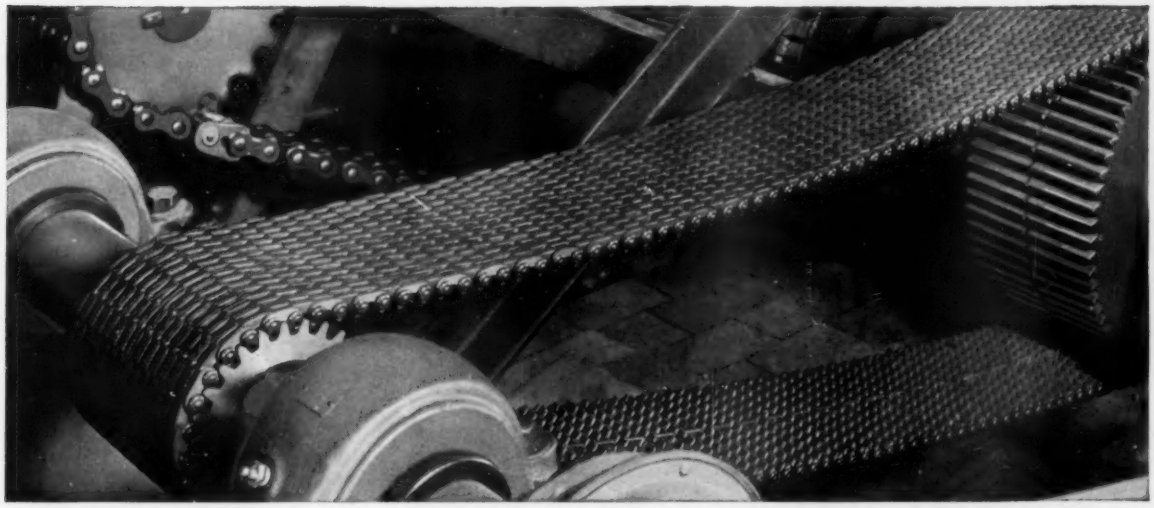
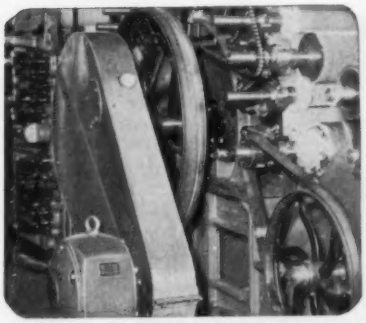
Check your drives against the benefits of

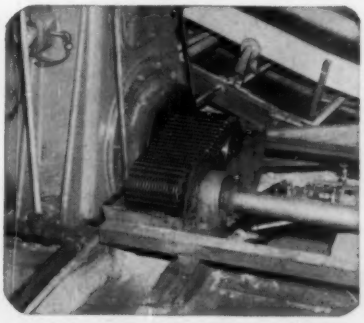
LINK-BELT silent chain



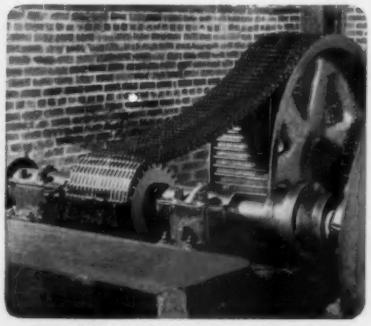
☐ **HIGH SPEED.** Link-Belt silent chain drives are noted for slipless dependability—maintain better than 98% efficiency whether operating over large or small diameter wheels or on long or short centers. For further details on these and more advantages, call your Link-Belt office or authorized distributor.



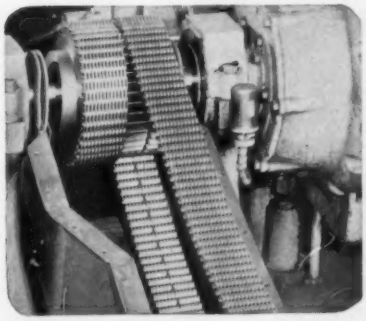
☐ **ADVERSE OPERATING CONDITIONS.** Heat, humidity, cold do not lower Link-Belt silent chain's great efficiency.



☐ **LARGE OR SMALL HP.** A versatile line, these Link-Belt drives are available from fractional to thousands of hp.



☐ **LARGE RATIOS.** Link-Belt silent chain operates efficiently on extremely short centers at ratios as high as 10-to-1.



☐ **LIMITED SPACE.** Easy to assemble in close quarters, Link-Belt silent chain permits built-in drives, compact housings.

☐ **LONG LIFE.** After 13 years on this newspaper press at speeds up to 4,700 fpm, Link-Belt silent chain is still efficient.

Ask for 88-page Book 2425 — complete data on Link-Belt silent chain drives.

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14,035

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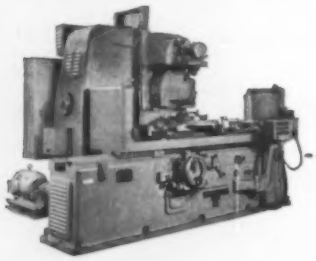
Thompson Precision Surface Grinder, Type C



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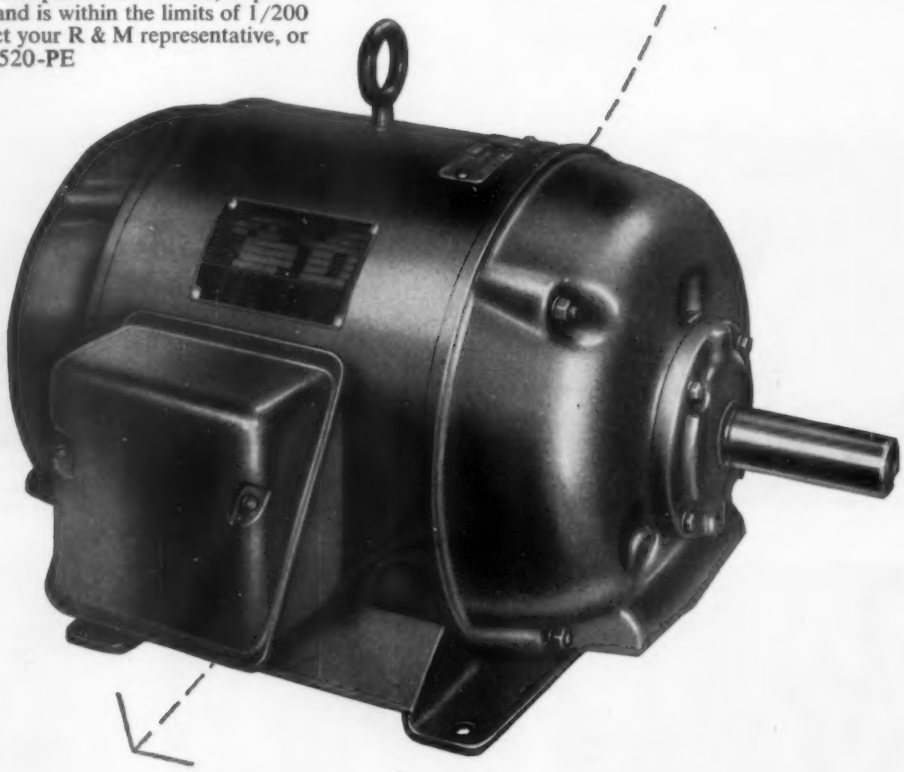
motor balance boosts Thompson precision!



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CONSTRUCTION BRIEFS — a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF A TRUSSED ROOF PART II

IN THE LAST Brief the discussion of the design of a trussed roof was begun. The design was carried up to, but not including, the truss. This Brief will discuss the design of the truss, bracings and struts.

Design of Typical Truss

The illustration shows a line drawing of the proposed truss, including the loads and reactions. The load to each panel point is computed in the following manner:

From the previous Brief,

Dead load =	
Gypsum plank $11.0 \times 5.6 \times 20$ =	1232 lb
Roofing material $5.0 \times 5.6 \times 20$ =	560 lb
Wt. of purlin 15.3×20 =	306 lb
Est. wt. of truss (Assumed concentrated at the panel points)	202 lb
	2300 lb

In the proposed truss design, although a load of 1.15 kips occurs at L_0 and L_5, it is resisted completely by the reaction and does not, therefore, produce any stresses in the members of the truss. For this reason, it is not included in the computations.

The analytic procedure of determining the forces in each bar member by either cutting sections about joints or planes through the structure, which was illustrated in previous Briefs, will be demonstrated here. This procedure, however, is more complicated than a graphical method known as the Maxwell Diagram. It is particularly so in this case, due to the complicated geometry of the truss. The reader may wish to review the Maxwell Diagram and will find illustrations of the method in most books on simple structures.

In this problem tension forces will be called positive and compression forces are negative. In cutting a section or a plane if the truss member force is directed away from the joint it is positive; if directed into the joint it will be negative.

The computation for each member is shown in the drawing (next page).

The members of the truss will each be designed to resist the forces. Tension members will be designed so that the net area of the member will be stressed below 20,000 psi. The compression members will be designed so that the gross area of the member will be stressed below an allowable stress which will vary with the slenderness ratio. It is recommended that the reader review the Brief which appeared in June, 1956.

Rivets used in the connections of the truss will be ⅞-in. Therefore, any leg of the angle members that receives a rivet must be at least 3 in. in width. Outstanding legs that do not have any rivets may be smaller. The outstanding legs of the angles of the bottom chord will have rivets to connect to the bottom chord bracing system. All other tension members will have rivets in the back-to-back legs only.

Assuming that the truss can be assembled and delivered to the job site in one piece, it is economical to provide a continuous bottom chord—the upper chord members $L_0 U_4$ and $U_4 L_5$ to be in one piece and the diagonals $U_4 L_2$ and $U_4 L_3$ to be in one piece. It is therefore only necessary in each of these cases to design for the panel subject to the worst conditions.

In addition to the above limitations of design, the AISC specifications require that all compression members of the truss have a slenderness ratio not exceeding 120 and all tension members have a slenderness ratio not exceeding 240. The minimum thickness of material shall be ¼ in. Although single angles can more efficiently be used for the lightly-loaded web members of the truss, many designers do not use single angles because of the eccentricity they will produce. We will comply with this requirement.

Table 1 shows the design of the members of the truss to comply with the above requirements.

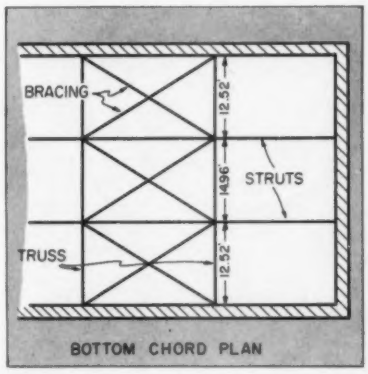


Fig. 1. Plan view shows trusses, bracing

A minimum of two rivets is required in the connection of the angles to their gusset plates. If 5/16-in. gusset plates are used, then the rivet value R, which is governed by bearing in double shear, is 10.9 kips, and the value of two rivets is 21.8 kips. Since no member is stressed more than 18.0 kips, only two rivets will be required.

To check the total truss weight, the weight of each truss member (consisting of two angles) is multiplied by its length. The sum of these weights is the total weight of the truss.

L_0L_5:	9.8×40 =	392 lb
L_0U_4, U_4L_5:	$9.8 \times 22.4 \times 2$ =	439 lb
U_1L_1, U_7L_4:	$8.2 \times 2.8 \times 2$ =	46 lb
L_1U_2, L_4U_6:	$8.2 \times 6.26 \times 2$ =	103 lb
U_2L_2, U_6L_3:	$8.2 \times 5.6 \times 2$ =	92 lb
U_2M_1, U_6M_2:	$8.2 \times 6.26 \times 2$ =	103 lb
U_3M_1, U_5M_2:	$8.2 \times 2.8 \times 2$ =	46 lb
L_2U_4, L_3U_2:	$8.2 \times 12.52 \times 2$ =	205 lb
		1426 lb
+ 10% for gusset & rivet heads =		143 lb
		1569 lb
Estimated Wt. = 202×8 =		1616 lb

Table 1. Design factors for roof truss, assembled with double-angle members

Member	Force (kips)	Member (2 angles)	Gross Area, C Member Net Area, T Member	Actual Stress (psi)	l/r	Allowable Stress (psi)
L_0L_5	+16.10	$3\times3\times\frac{1}{4}$	1.88 sq in.	8600	193.0	20,000
L_0U_4	—18.00	$3\times3\times\frac{1}{4}$	2.88	6250	72.3	14,470
U_1L_1	— 2.06	$3\times2\times\frac{1}{4}$	2.38	870	59.0	15,310
L_1U_2	+ 2.30	$3\times2\times\frac{1}{4}$	1.88	1220	132.0	20,000
U_2L_2	— 4.12	$3\times2\times\frac{1}{4}$	2.38	1730	118.0	10,250
U_2M_1	+ 2.30	$3\times2\times\frac{1}{4}$	1.88	1220	132.0	20,000
U_3M_1	— 2.06	$3\times2\times\frac{1}{4}$	2.38	870	59.0	15,310
L_2U_4	+ 6.90	$3\times2\times\frac{1}{4}$	1.88	3670	132.0	20,000

Design of Bearing Plate

The truss will be supported on a steel bearing plate that will transmit the load of the roof to the brick wall. If required, pilasters will be provided. The allowable bearing pressure of hard brick in cement mortar is 250 psi. The total reaction of the truss equals 8.05 kips plus the load to L_1 or L_5 of 1.15 kips = 9.2 kips.

Therefore the required area of bearing plate is $\frac{9200}{250} = 36.8$ sq in. Use a 7 in. by 6 in. plate. Since there will be no projection of the plate to either side of the angles, then a nominal thickness of plate is required; use a 7 in. by 6 in. by ½ in. bearing plate.

Design of Bracing

The diagonal bracing members for the bottom chord shown in Fig. 1 (a portion of the roof plan shown in Part I of this Brief, in Plant Engineering, December 1956) are designed so that the slenderness ratio does not exceed 200, the allowable value for secondary members. The braces are usually double angle members. They cross each other on the same plane and are connected by a gusset plate. One set of braces will be the complete diagonal length while the other will be spliced at the junction. From this it is seen that the unsupported length in computing the slenderness ratio for the r about a horizontal axis is the full diagonal length, while for the r about a vertical axis it is ½ the diagonal length. For this reason the angles should be selected and oriented so that the r about the horizontal axis is about twice the r about the vertical axis.

From Fig. 1, the longest diagonal length $= \sqrt{14.96^2 + 20^2} = 25.0$ ft.

Therefore the required r about the horizontal axis $= \frac{25 \times 12}{200} = 1.5$ in.

and the required r about the vertical axis $= \frac{1.5}{2} = 0.75$ in.

Use 2 5×3×5/16 angles, long legs back-to-back

r about horizontal axis = 1.61

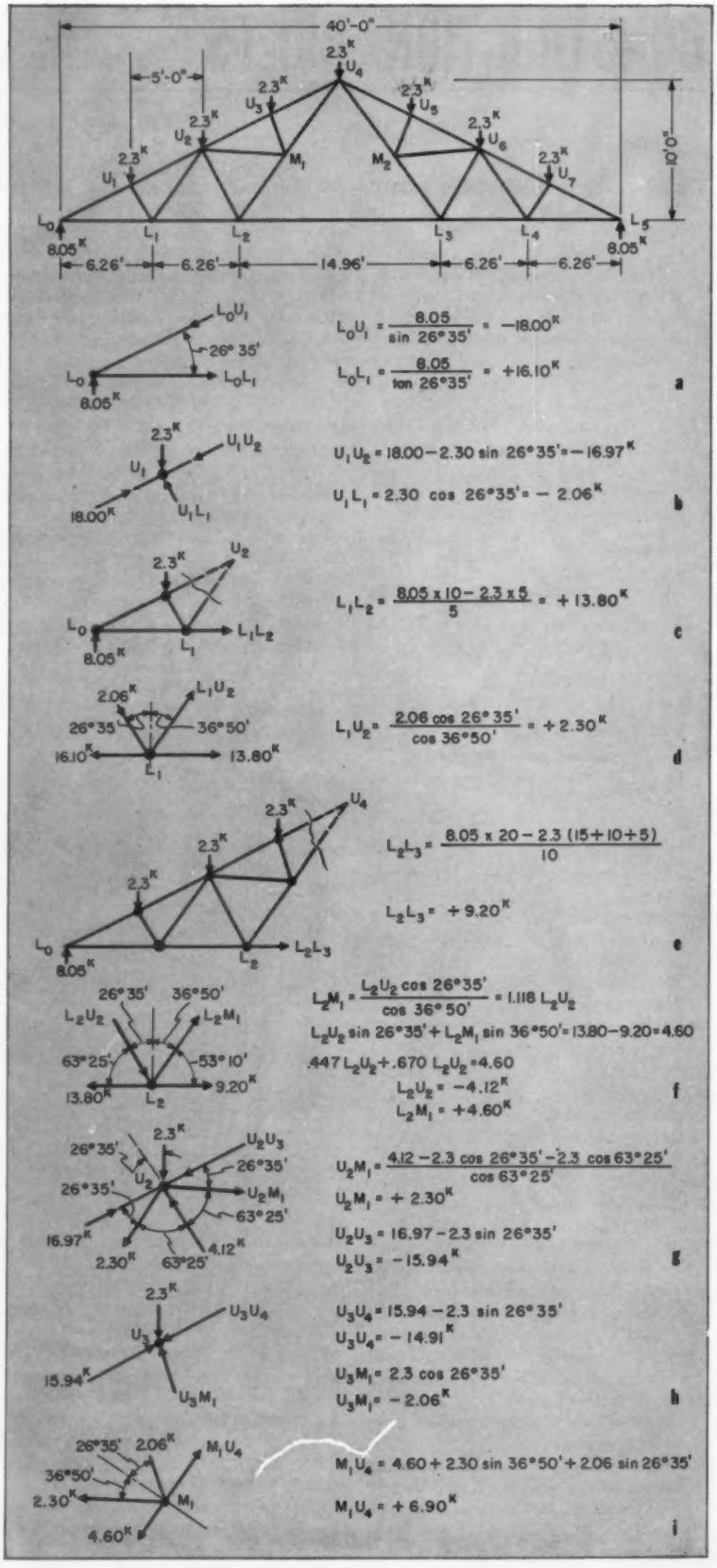
r about vertical axis = 1.09

Design of Struts

The struts are also designed as a secondary bracing member. Since the unsupported length is the same in both the horizontal and vertical directions a double angle member will be selected where the r in both directions will be most nearly equal. Therefore:

the required $r = \frac{20 \times 12}{200} = 1.2$ in.

Use 2 4×3½×¼ angles, long legs back to back; least r = 1.27 in.



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How does an oil company

prepare men for industrial technical service work?

Here's how Standard Oil trains its men

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Lectures, shop and lab work comprise training course.

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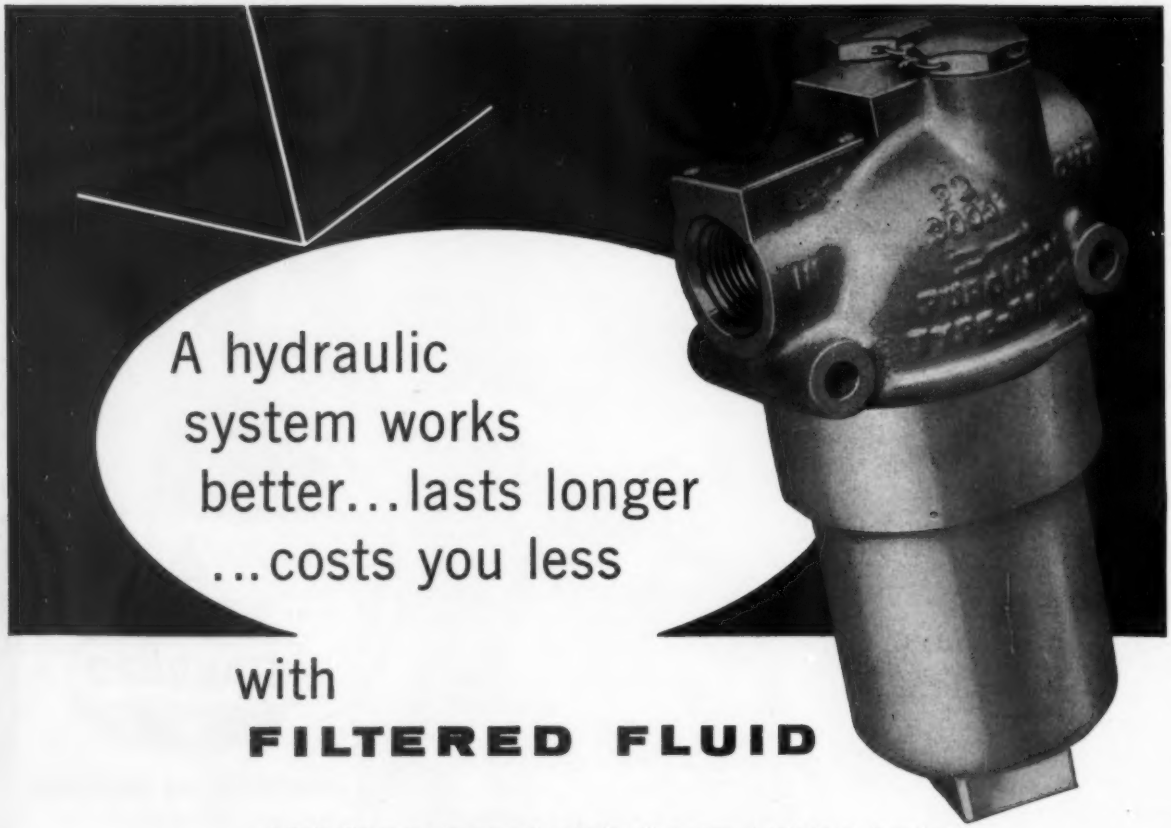

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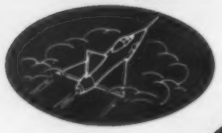

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...4 frame sizes available for immediate delivery

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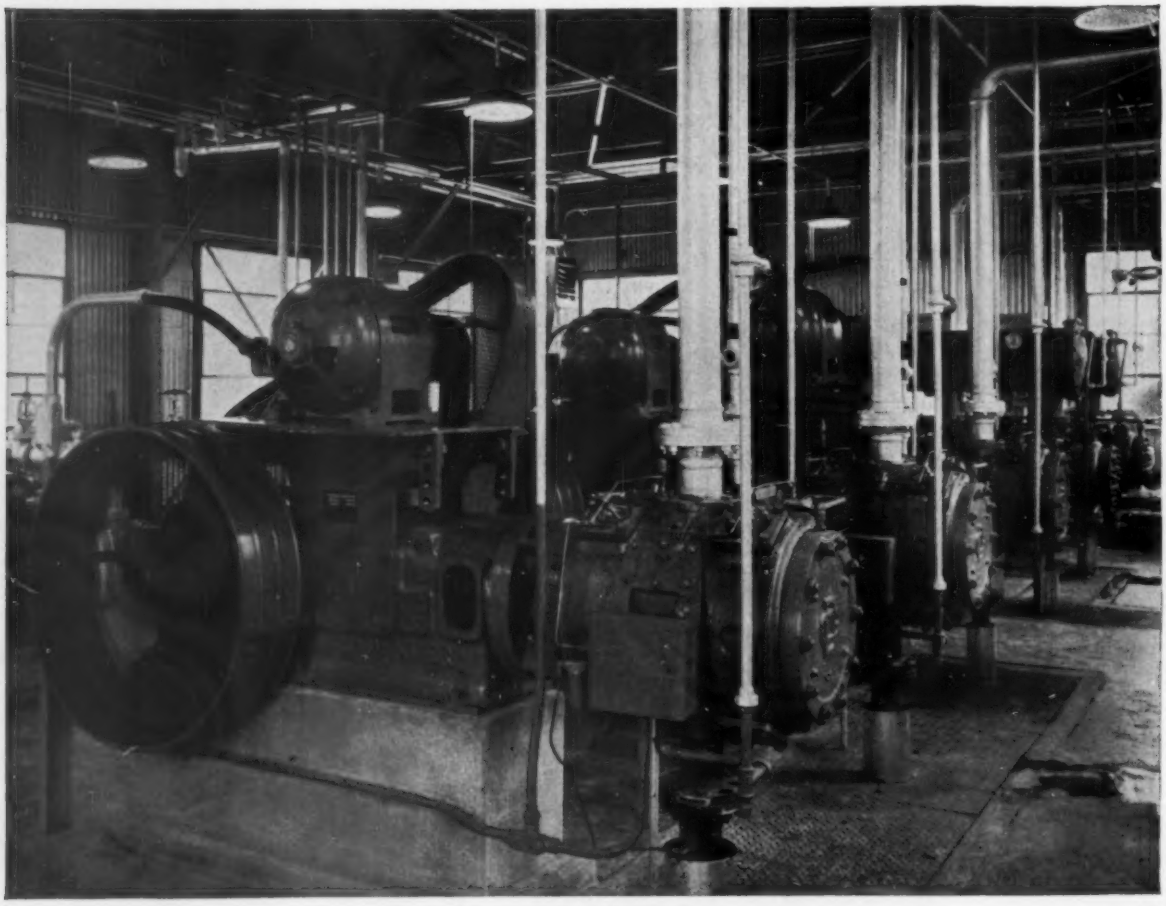

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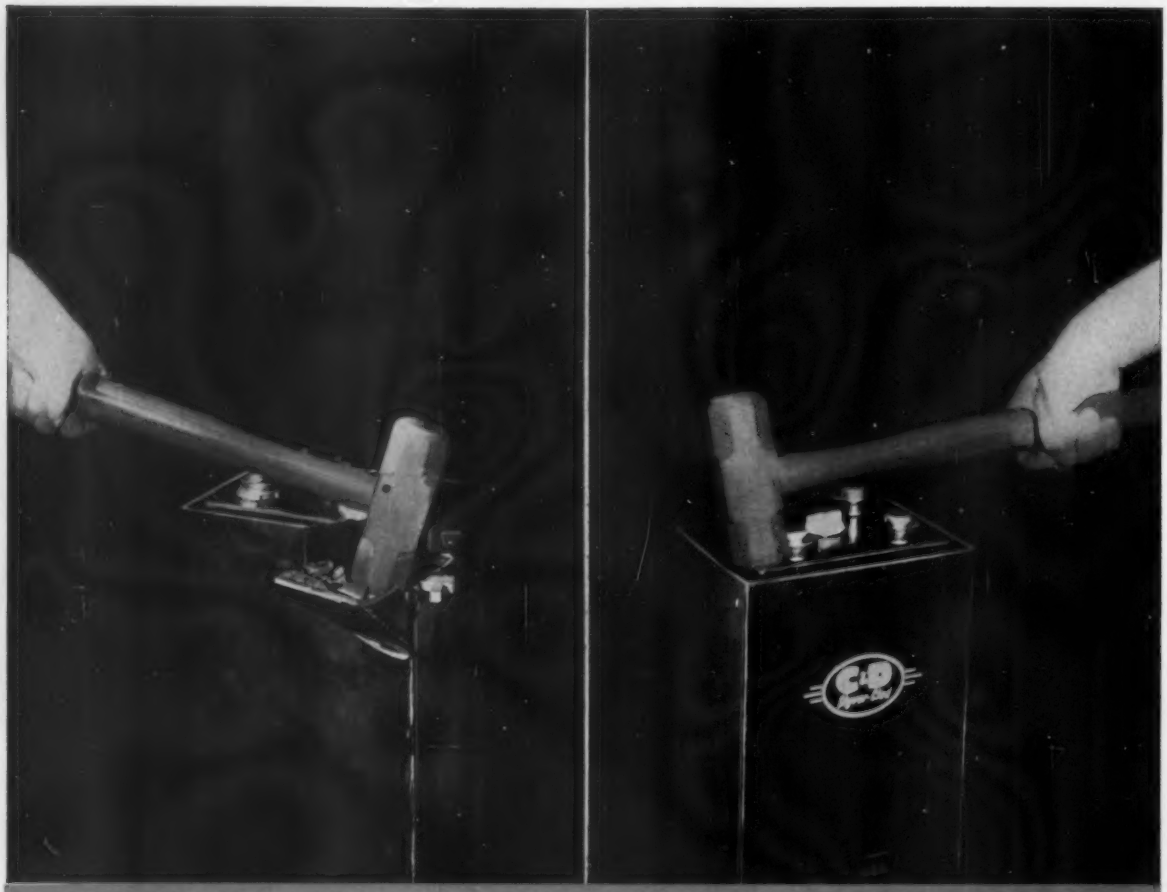

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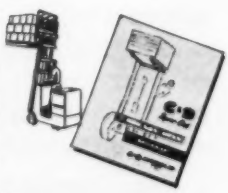

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Industrial Ventilation

THIS MANUAL PRESENTS NEW, THOUGHT-PROVOKING IDEAS ON INDUSTRIAL VENTILATION . . . . THE AUTHOR, AN OUTSTANDING VENTILATION ENGINEER ON THE RESEARCH STAFF OF GENERAL MOTORS, OFFERS HIS PLANT-TESTED METHODS AND IDEAS IN GRAPHIC, CONCISE FORM . . . . PLANT ENGINEERS EVERYWHERE CAN ACHIEVE BETTER RESULTS FROM THEIR OWN PLANT VENTILATING EQUIPMENT BY ADHERING TO THESE COMMON-SENSE RULES

The Author:

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Research Staff, General Motors Corp., Detroit, Mich.

A Manual for Modern Plant Ventilation Practice

Here's an installation that, in operation, proves the author's principles of correct design and layout for industrial ventilation systems. Heated air made up of fresh outdoor air and recirculated air is discharged through the registers at a velocity of 1600 fpm. This projects the air 50 to 75 ft into the room where its heat is available to workers on floor level

. . . Comfort and safety of workers are the prime objectives of plant ventilation. If these objectives are not achieved the installation is a failure. If the objectives are not achieved economically plant engineering bears the brunt of the blame—as it should—if it has been given a free hand on methods and equipment. Here are some good, working ideas on proper ventilation based on unchanging principles

WHENEVER AIR is exhausted from a building, make-up air (or air supply as it is sometimes called) is necessary. Most engineers agree with this, but fail to realize the overall importance of make-up air. Consequently, it is often ignored when planning plant facilities or when studying employee comfort and efficiency.

Along with knowing how much make-up air to supply, one must also know where it should be introduced, at what velocity it should be introduced, and how it should be controlled. Failure to properly provide make-up air can result in reduced production and personnel problems.

Make-up air is only one leg of an often ignored, but very troublesome, triangle. The other two factors are heating and exhaust ventilation. The need for heating has been accepted for years, and yet many so-called modern plants are limping along with outdated, horse-and-buggy methods and equipment. Industrial exhaust systems, as they are considered today, are relatively new.

Comfort is usually considered to be attained when the heat gain and loss of the body is so regulated that we are not conscious of heat or cold. Records show that it wasn't until about 1912 that anyone became seriously interested in what this condition should be. At that time a doctor was invited to talk to the American Society of Heating and Ventilating Engineers. He had stated that work should be done to find the proper air temperature, air movement, humidity and radiation for the comfort of man. It wasn't until the early 20's, however, that work was actually underway.

The original work was carried out by placing semi-nude people in rooms which were maintained at various saturated air temperatures. Their reactions were recorded and it was determined at what saturated air temperature most people were comfortable.

It's the Effective Temperature That Counts

In the chart, Fig. 1, the diagonal lines running toward the top right hand corner are for relative humidity. We are, in this article, particularly interested in the E. T. (effective temperature) lines which are the curved diagonal lines running toward the lower right section of the chart. E. T. or effective temperature is a combination of wet and dry bulb temperatures that has the same effect on the body as has saturated air at the same temperature. For example, 68-deg E. T. has the same effect on the body as does saturated at 68 deg.

If we have a reading of 70-deg dry bulb and 70-deg wet bulb, we will have a saturated condition and the two lines will intersect at the 70-deg E. T. line which comes downward at an angle. Any combination of wet and dry bulb temperatures which falls on this line results in an E. T. of 70 deg and will be in the comfort zone.

The areas on the upper and lower sides of the main chart allow us to determine what percentage of people are comfortable at a given E. T. Most of those tested voted for about 71 deg for summer and 68 deg for winter comfort. As is noted at the left side of the chart, these figures are for still air only.

It is not suggested that industrial plants must provide these so-called comfort conditions. However, it does serve as a benchmark, and if we add upper and lower limits to these comfort conditions we will have an indication of the state of well being of the workers in our plants. If we are interested in these people maintaining efficiency, then we will provide working areas that approach the comfort zone.

Another form of the E. T. chart in which air motion is taken into account appears in Fig. 2. The wet bulb temperatures are given on the right hand side and the dry bulb temperatures on the left. The diagonal lines running toward the upper right corner are for different air velocities, with the lower one reading 30 fpm. Any lower velocities are considered to be still air.

On this chart velocities from 30 fpm through 700 fpm are given. The E. T. lines are similar to those on the previous chart running generally at a diagonal toward the lower right hand corner. The dotted line represents a condition created by 65-deg wet bulb and 80-deg dry bulb. The E. T. created by this condition varies from about 72 deg to 60 deg depending on what velocity one is exposed to. At 40 fpm the E. T. would be 71 deg which is ideal for summer. At 100 fpm the E. T. is reduced to about 68 deg which is most desirable during the winter months.

As stated before, this chart plots the effect of air movement up to 700 cfm. A question may be raised as to what is the best velocity for summer cooling and what is the maximum that can be used. Although it has been stated that there is no additional value derived from air moving at more than 800 fpm, workers in some hot industries do not agree with this. Air movement exceeding 3000 fpm is often persistently requested. In some plants, small high velocity jets are provided so the employees can walk in and out of the air pattern. The claim is made that under these conditions the cooling effect is more noticeable.

Measuring and Controlling Radiant Heat

In most discussions with plant personnel there is no difficulty explaining the effects of wet and dry bulb temperatures or air motion, but radiation and the strain it places on those exposed to it is not so well understood.

There are several reasons for this misunderstanding. Radiant heat travels in a straight line like light and can be reflected or absorbed. It cannot be controlled by ventilation unless it is converted to some other form of heat. It cannot be measured by an ordinary thermometer without attachments.

A common method of measuring radiant heat is by the use of a thermometer encased in a thin-wall, black globe. An ordinary copper toilet float which has been painted will serve. This unit is placed where the reading is desired and left until equilibrium is reached. This will result when the loss by convection just balances that received by radiation. According to one authority

Fig. 1. Comfort chart, designed by ASH&AE, resulting from tests made on groups of people. Tests showed that 68 deg E. T. was the most desirable E. T. for winter comfort while 70 deg E. T. was the most desirable for summer temperatures

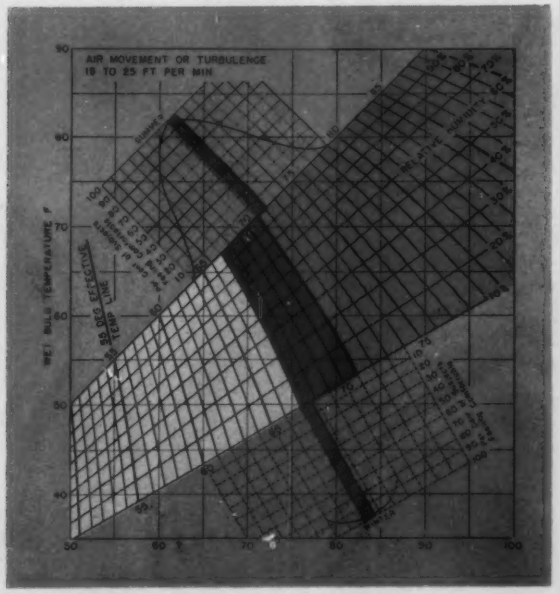
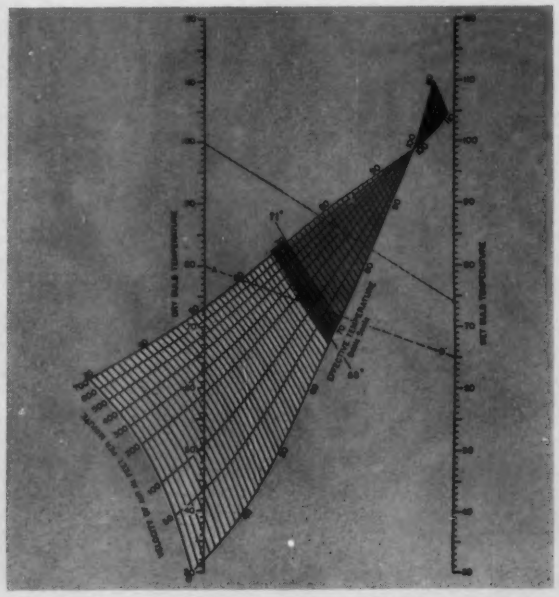


Fig. 2. This is another form of the effective temperature chart in which air motion and its effect are taken into account. The lowest air velocity indicated on the chart is for 30 fpm. Speeds lower than this are considered as still air



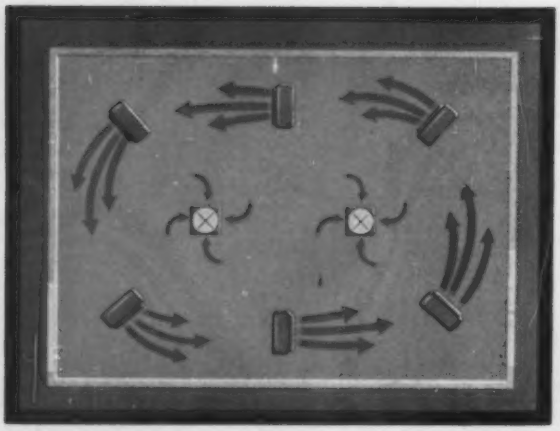


Fig. 3. This arrangement of unit heaters is fairly common. Author explains why it seldom works as anticipated

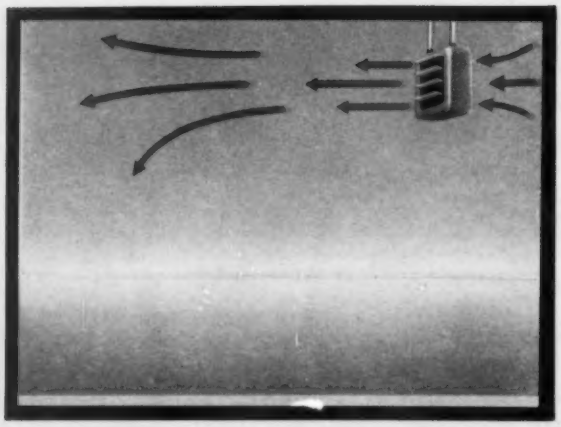


Fig. 4. Unit heater installation such as this is inefficient, says author, and does little to create comfort zone

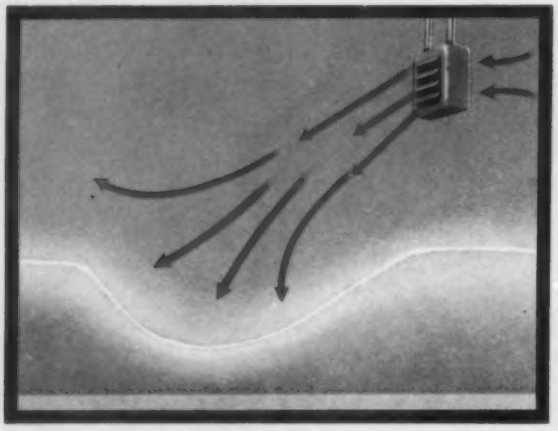


Fig. 5. Even with louvers turned downward as in this installation, heated air will bounce back toward top of room

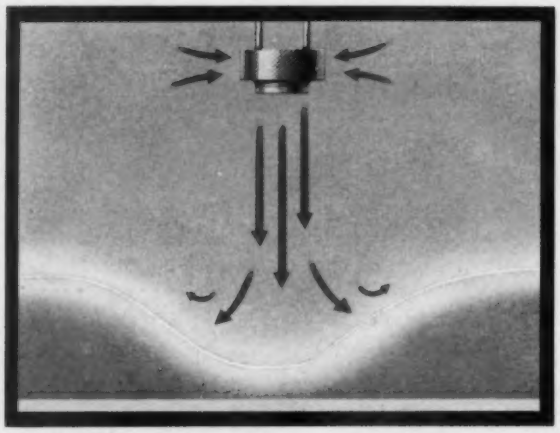


Fig. 6. This is a different type of unit heater but the air it heats still bounces back to top of room's air mass

this reading can then be used in place of the dry bulb reading taken at the same location providing that the moisture content of the air is maintained at the same level.

A standard psychrometric chart will allow us to do that. On this chart the dry bulb temperatures are plotted across the bottom of the chart, and the wet bulb along the diagonal and project diagonally downward on the curved lines. The lines running from lower left to upper right are for relative humidity and can be ignored. The horizontal lines are for grains of moisture and must be considered if we are to use our globe thermometer readings. Such a chart may be found on pages 51 and 53 of the 1956 edition of the ASHAE Guide.

In one plant where 65-deg wet bulb and 80-deg dry bulb readings were taken (these are shown in Fig. 2) a globe thermometer reading (showing radiant heat) was found to be 100 deg. To substitute this, we must follow the 80-deg dry bulb reading upward until we intersect the curved 65-deg wet bulb line. To maintain the same moisture content, we move to the right on the grains of moisture line until we intersect the 100-deg dry bulb line, we then follow the curved line upward and to the left and read our new wet bulb as 71 deg, approximately.

How Do We Find the Comfort Range?

By substituting these new temperatures on the E. T. chart in Fig. 2, we can determine if we are in the comfort range. We find by the heavy line that the E. T. will be between 77 deg and 81 deg depending on the air movement. A few people might be comfortable at 77 deg but 81 deg E. T. is too warm for comfort even for a person at rest. This is not an exaggerated condition. For example, I remember one plant where globe temperatures were found to be 40 deg and 50 deg above dry bulb, and another where temperatures taken at the pouring station were more than 60 deg above dry bulb temperatures.

In fact, the globe temperatures were still going up, but so was mine and I was holding the globe in position. Therefore, I did not wait for it to come to equilibrium. Surely you have noticed the effect of radiation when standing in front of a fireplace or in front of a large picture window.

On the other hand, the reverse of what has been shown here can also happen and the body will then radiate heat to the cold surface.

There are upper and lower limits for the comfort chart. When dry bulb temperatures drop much below 65 deg accidents tend to increase. When temperatures are above 80 deg, speed usually decreases and errors increase. When E. T. exceeds 90 deg work can usually be carried on only 1/3 to 1/2 the time and the balance of the time is spent in resting. With this prologue on heating and comfort, let us now

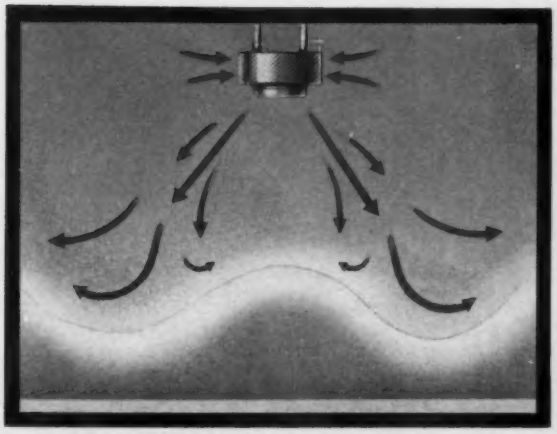


Fig 7. Fins are adjusted to project air at angle. This affects more people but still does not provide comfort zone

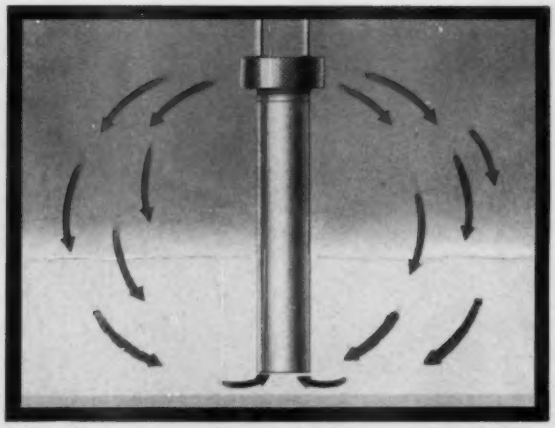


Fig. 8. This is an improved installation. Cold air is lifted from floor and warm air rushes in to fill low pressure

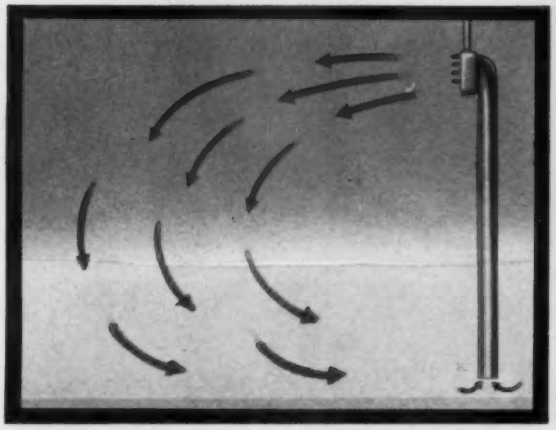


Fig. 9. Here, too, the return air duct with same type of heater shown in Fig. 4 lowers warm air to worker level

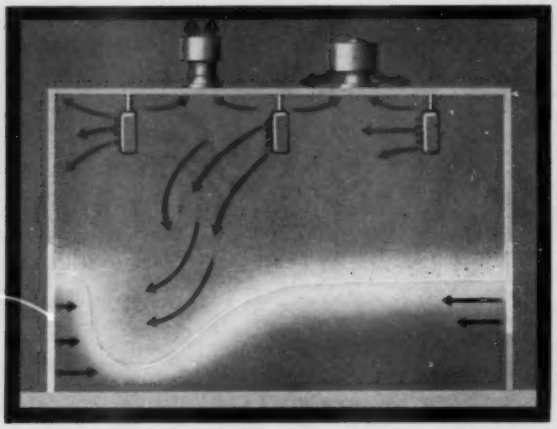


Fig. 10. No comfort zone in this typical plant. Warm air is exhausted through roof. Does poor job in summer, too

see where make-up air fits into the picture.

Figure 3 presents a plan view of a typical plant unit heater system as laid out by many designers. The unit heaters are spaced with the thought that each one will project heated air forward to heat the wall between it and the next unit. Usually the heating and the exhaust fans are placed as though there was to be no manufacturing within the plant or no process heat or exhaust to be considered.

An elevation of a typical unit heater installation with the heater suspended near the ceiling above the building trusses is shown in Fig. 4. Ordinarily this type of unit is controlled by a thermostat which turns the fan on and off. If steam is used, it is usually uncontrolled and if it is gas-fired the burner comes on with the fan. As shown by the colored arrows, the warmest air in the room is forced through the heater and discharged at an even greater temperature. Although this is a common type of installation, it is inefficient and does little to create a comfortable working zone area.

Illustrated in Fig. 5 is a heater similar to the one shown in Fig. 4 but with the fins turned downward in an attempt to heat the working area. Due to the difference in density of the air this warm air will not stay down any more than a ping pong ball will stay beneath water even though it is injected into the water at high velocity. This type of system results in hot spots throughout the plant and anyone unfortunate enough to work in the air stream is exposed to hot blasts of air when the heater is on and resultant chilling when the heater is off. Again you do not have a comfort zone.

Blame the Installation, Not the Heater

Figure 6 shows a different type of unit heater. Nevertheless the results from this installation are the same as those previously shown. The hot air is drawn in the sides, heated and projected downward. Again we have the hot spot but no comfort zone for anyone working beneath the heater.

Another view of the same heater is given in Fig. 7. Here, the fins (which are concealed directly beneath the fan) have been so arranged as to cause the air to be projected downward at an angle rather than straight down. If the air has sufficient velocity, it will affect more people over a greater area but will not provide any additional comfort.

One method of improving such an installation is shown in Fig. 8. In this case the motor has been reversed and a duct has been added, running from the heater to within approximately one foot of the floor. Now the cold air is lifted from the floor, taken up and heated by passing through the heater which results in the warm air being drawn to the floor to fill the low pressure area caused by the removal of the cold air.

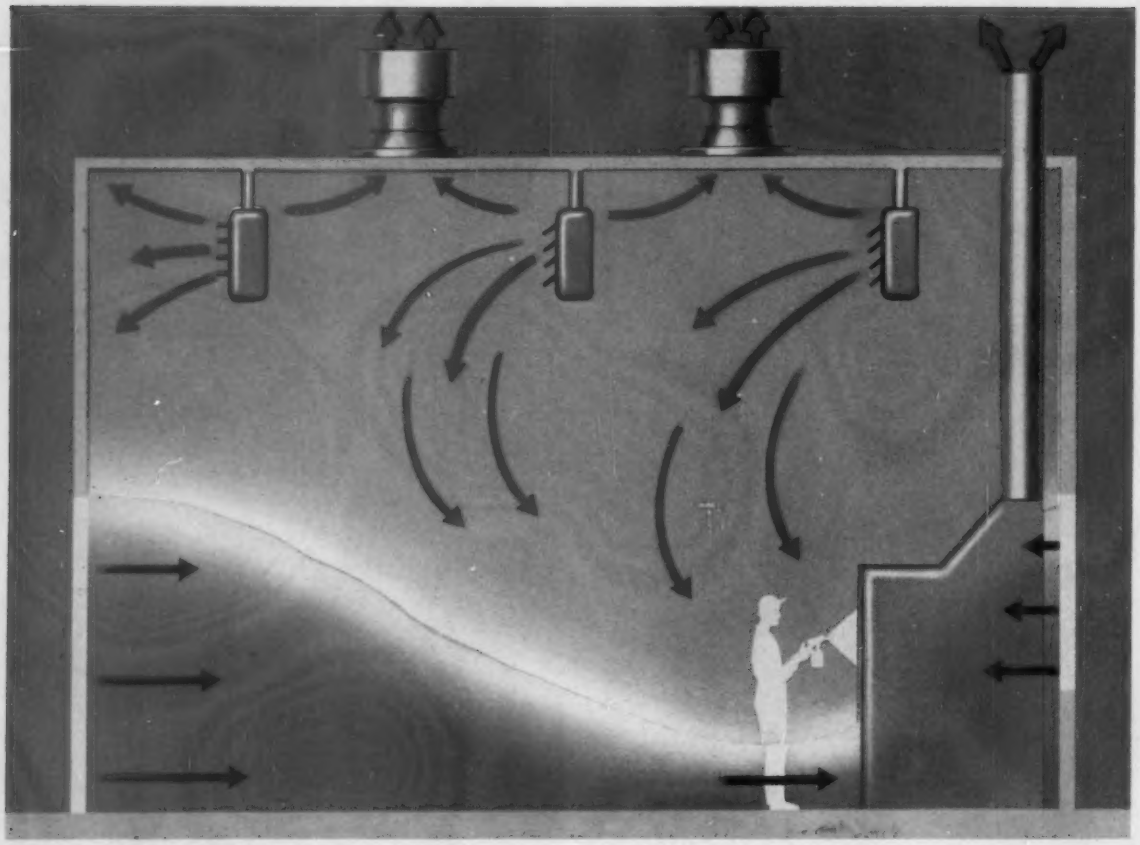


Fig. 11. With no change in heating or ventilating systems, new operations have been added in plant. These require exhausting of additional quantities of air, creating negative pressure in building. Note arrows showing infiltration of cold air

Actual smoke tests prove that a heater ducted in this manner will provide comfort in the working zone under many conditions. This is of value in small buildings where light work is being carried out and little or no heat is generated by the operation.

In the arrangement in Fig. 9 use is made of a heater such as the one shown in Fig. 4 except that here too, there has been added a return air duct. Note that the louvers direct the air so that a greater area will be covered.

We know that this air will return along the floor and will bring heated air down into the working zone. Previously, I mentioned the type of controls usually found on unit heaters. Of course, when the thermostat is satisfied and the fan shuts off, stratification may occur. It has been proven that when stratification does occur, a person at rest or doing light work, such as a woman working on inspection, will usually feel uncomfortable with only one, or one and a half degrees temperature change.

If the air can be kept in motion, a person under the same conditions will stand as much as five or six degrees temperature change before discomfort results. Undoubtedly, many persons have had the same experience in their own home; although the thermostat operates on a one and a half to two-degree differential, it is cool before the burner comes back on.

In many cases this same problem in industry can be eliminated by varying the heat input to the unit heaters according to outside temperature and allowing the fan or blower to operate constantly during the working hours.

Heated Air Forced Out, Cold Air Sneaks In

A section of a typical plant appears in Fig. 10. This arrangement does not provide a comfort zone.

Exhausters are removing air from the building. This naturally results in infiltration of cold air in the working zone. Even though winter operations are the main consideration here, please note the exhaust ventilator on the right. This unit may cause difficulty in the summer months. If exhausts similar to these are placed over the heat treat area it has been found that the combination of heat beneath the roof from the heat treat furnaces, the heat absorbed by the roof from the sun, and the discharge of hot air downward from the exhausters to the roof will result in temperatures detrimental to the roof.

Temperatures on a mild day exceeded 165 deg on one roof and in order to eliminate the melting of the roofing material, baffles have had to be installed to prevent this hot air from striking the roof deck.

Another section through a plant is shown in Fig. 11. An operation has been added which requires the exhausting of additional quantities of air. This reduction of pressure inside the plant as shown by the dark area causes increased infiltration of outside air through cracks and crannies. This, in turn, results in uncomfortable temperatures around the inside perimeter of the building.

It is also an added load on the heating system as this cool air mixing with the room air lowers room temperature and the heating system attempts to keep temperatures at the level called for by the thermostat. By the time this cold air is heated, it has been drawn across the room and is exhausted. The air-bound condition

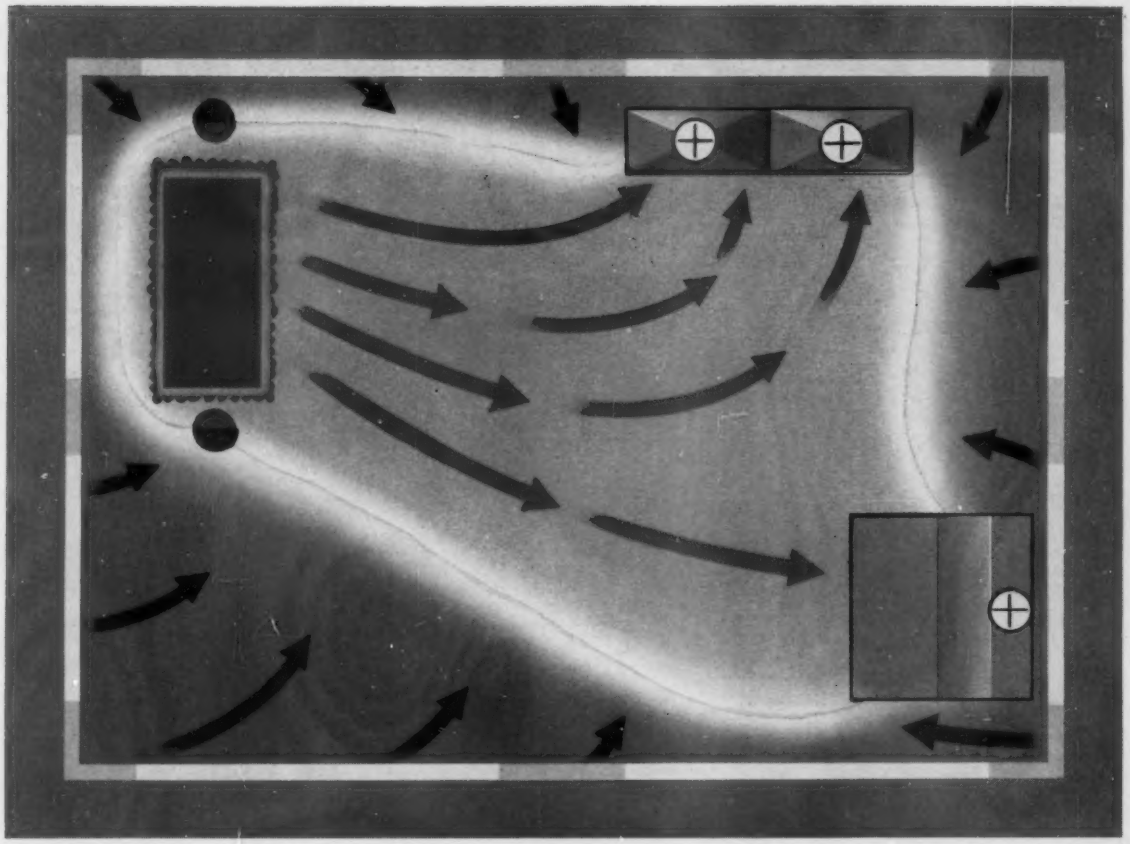


Fig. 12. This is a plan view of the same plant shown on the opposite page. Workers (shaded circles) are exposed to radiant heat from furnace on one side and to cold drafts on the other side. This condition is typical of many industrial plants

caused by this high infiltration rate may also cause down draft through stacks and flues, carrying with it such toxic gases as carbon monoxide which are frequently present in the flues from direct fired heating units.

Figure 12 is a plan view of the same plant. The operations responsible for the high rate of exhaust—the spray booth, and other units—are shown, as is the heat treat furnace. The two shaded circles represent men working near this furnace. As the shading indicates, they are exposed to high temperatures on one side and cold drafts on the other side. We have checked similar conditions and found radiant temperatures ranging from 130 deg to about 170 deg. This is typical of nearly all plants needing make-up air: a cold area completely around the exterior of the plant with an excessively warm area through the center.

As previously mentioned, the cold area near the edge is brought about by the high infiltration rate. To overcome this condition the tendency is to continually increase the thermostat setting with the result that the central part of the plant receives excessive heat. For all practical purposes, it is impossible to heat air which is drawn in through the doors and windows by ordinary industrial heating systems.

A number of plants have been studied and air at velocities of 2,000 fpm was found entering shipping room doors. With doors having from 100- to 200-sq ft areas for openings, that means 200,000 to 400,000 cfm at perhaps zero degrees entering the working area. It would take 15 to 35 million Btu's per hour to temper this amount of air. This shows that unit heaters near the doorway is not the answer.

If You Can't Change Principles, Use Them

Using the same plant shown in Figs. 10 and 11 as a base of operation, we have worked out a method in Fig. 13 designed to increase comfort in the working zone both winter and summer, to reduce smoke and fumes, and what may surprise you, also to reduce the total cost of operation. The furnace has been shielded to stop the radiant heat and a fire curtain has been installed which separates smoke generated by this operation from the rest of the plant. The general exhaust fans have been removed from the locations where they were not needed and one of them has been placed over the heat treat area where it can exhaust the smoke and fumes.

However, these changes will not be satisfactory unless we supply tempered air to the building proper. So, air is drawn from above the roof, passed through the make-up air heaters and delivered to the working zone through the ducts and grilles shown. By the use of proper controls the air is delivered at the most desirable temperatures. Many times the air will be supplied below room temperature in order to absorb the heat generated by the machinery. Only in this way can a comfortable working zone be furnished for the employees.

It requires good engineering to determine the size, location and type of make-up air units which are to be used. This is even more important with the flat, wide buildings that are so popular today. As an example, one plant has spent many thousands of dollars in revamping the heating controls even though the architect had a

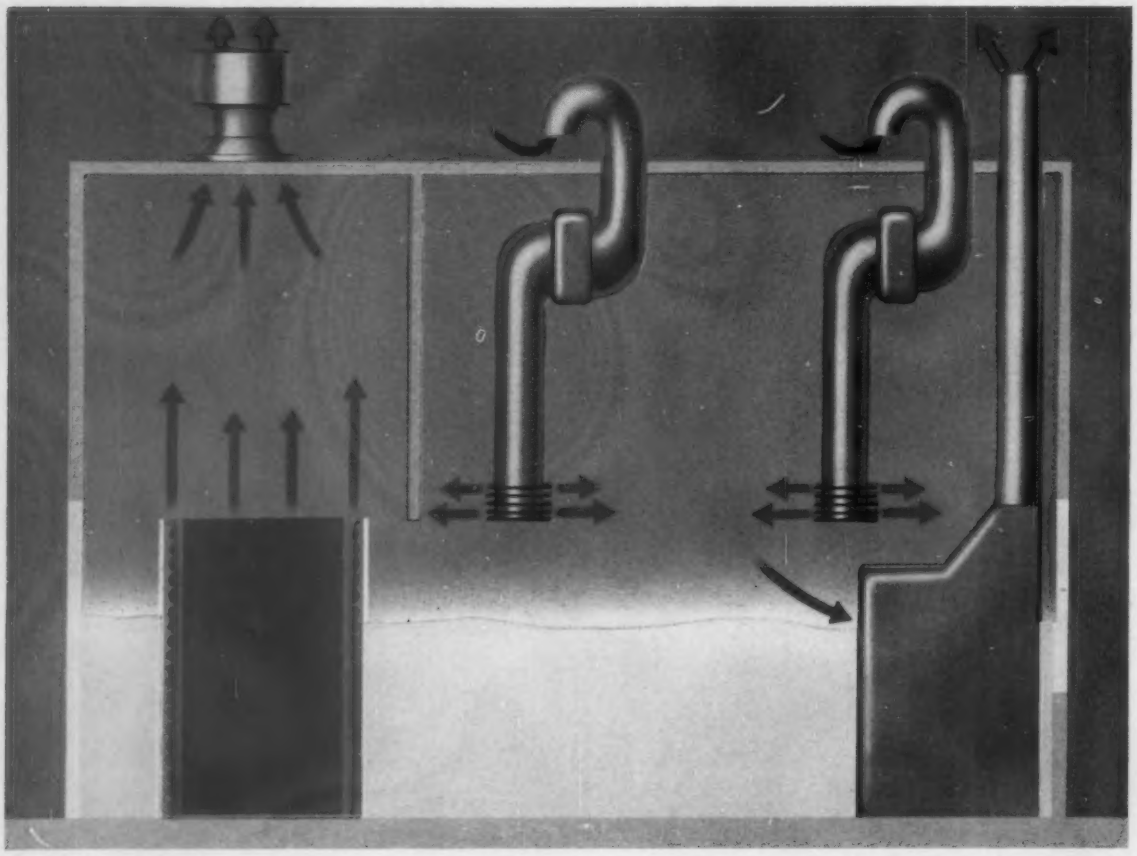


Fig. 13. On this sectional drawing of the same plant shown in the preceding two drawings the author applies the principles set forth. They include radiant heat shields, fire curtain, low heated air discharge and relocated roof ventilators

mechanical engineer design a supposedly proper system. In this case the controls were situated in the outside air stream so that whenever the temperature dropped below 40 deg all outside air was closed off and, of course, this was when they needed the outside air the most. Worse, the air was discharged beneath the roof line which during summer months gave little or no cooling effect to workers.

In another plant, the units were sized to allow 25 per cent of the air to be brought in from the outside. Unfortunately the dampers were of such a size that the control motors could not operate them. Therefore, no outside air was entering the plant through the dampers. They have reworked these units, added new coils and changed the controls in order to make them suitable to handle all outside air. At the same time, duct work was added so that this air can be delivered to the working zone throughout the year.

As mentioned before, this working-zone outside air is desirable during the summer months. It is impossible to draw outside air through the windows of modern plants and have it satisfy the people in the center of the plant. At the same time air supplied in the working area will allow heat, smoke and fumes to rise to the roof where they may easily be exhausted.

Another plant has an installation similar to this in its core room. Here, they open the skylights and allow the smoke to escape. Before the make-up air system was installed the building was under such negative pressure that whenever the skylights were open, cold air was drawn in and the weight of this air held the smoke from the core ovens and the hot cores in the working zone.

In order to give such an installation flexibility, the registers are arranged so they may be adjusted by the employees to project the air horizontally or 45 deg downward as may be preferred.

Result: Comfort — In Practice as in Theory

The headpiece photograph at the start of this article shows a typical installation following the ideas set forth above. The air is discharged through the registers at a velocity of 1600 fpm which projects the air some 50 to 75 ft depending on conditions. This installation was designed to provide 12 air changes per hour to the lower 10 ft of the plant. After three years of operation of this new installation plant personnel is so well pleased they have specified a similar installation in a new building.

The same quantity of air heated and moved through a conventional installation, permitted the introduction of only 4 air changes per hour in the plant. This did not result in satisfactory conditions for either winter or summer operations.

It has not been my intention to condemn anyone's heating equipment. I do believe, however, that it is time for engineers to design and sell equipment on the basis of what it can do for the man located on the lower 6 ft of the building rather than on the basis that their equipment will introduce more Btu's into the building for less initial cost than their competitors.

A heating installation is not intended to heat the man. Rather we must control his rate of cooling if we wish to furnish a desirable environment for him.

How Much Steam? Chart Gives Answer

Set Down Problem, Draw Line, Read the Result

By WILLIAM W. GAYLORD, Consulting Engineer

CHART ILLUSTRATED on this page has been found to be very convenient and a considerable time saver in determining the amount of steam required to heat water where large supplies of hot water are necessary.

Somewhat similar charts applying to certain types of heaters have been published in trade catalogs but none apply to both steam converters or closed heaters, and steam blenders or mixing heaters, or that give the boiler capacity or rate of heat input required, all on a single chart.

The two examples given below illustrate how the chart can be used.

Example 1

Problem: A process requires 15 gal of water per minute at 200 F. Water is to be heated by steam at 30 lb gage pressure in closed or converter type heater and cold water enters the heater at 40 F.

Question: How many pounds of steam per hour will be required and what boiler horse power must be available?

Answer: Draw a line from 15 gpm on right hand scale through 160 F rise on left hand scale and read off 19,800 Btu per minute or 35 boiler horse power on center scale.

Next draw line through 30 psig and intercept the first line on center scale and read 1280 on pounds of steam per hour scale.

Example 2

Problem: One hundred and fifty gallons of water per minute at 180 F are required and this is to be heated in a blending heater. Cold water is supplied to the heater at 40 F and steam at 100 lb gage pressure.

Questions: How many pounds of steam per hour will be required and what boiler capacity must be supplied?

If boiler operates at 80 per cent efficiency and No. 5 oil is used, how much oil per hour must be used?

Solutions: Draw a line from 150 gpm on right hand scale through 140 F rise on left hand scale and read off 308 boiler horse power or 172,000 Btu per minute on center scale.

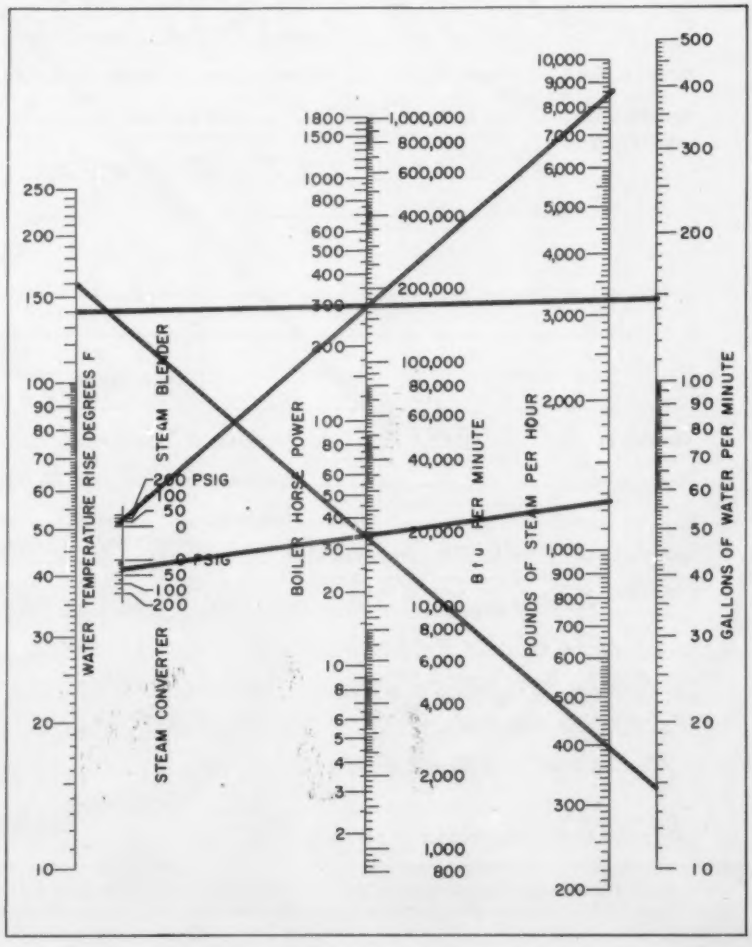
Next draw a line through 100 psig and 172,000 Btu on center scale and read 8,850 on pounds of steam per hour scale.

Then oil per hour will be

$$\frac{172{,}000 \times 60}{148{,}500 \times .80}$$

= 86.9 gal per hour

If you are heating water by steam, you will find this chart a considerable time saver in determining the amount of steam required for your hot water needs



The Mighty-Mite Story—How One Form

This is the leadman's name. It is entered by the maintenance clerk if she knows which one should get the order. If not, she checks with the supervisor

Priority "A" is the top priority. It is almost always assigned to jobs involving major repair of machinery. Three priorities—A, B and C—are used. They serve as a guide to leadmen in assigning jobs to various craftsmen

All the information in this area of the MSM is entered by the maintenance clerk who obtains this data from the department making the request

This is the signature of the craftsman assigned to the job. The leadman enters the name of the craftsman only on the second and third copies of the MSM. The craftsman signs off the job on the original copy

This is the accounting charge number. It is entered on the MSM by the maintenance clerk. She then gives all three copies of the MSM to the proper leadman

These are the details of the job done. Some jobs, such as tightening arms on chair, are not worth lengthy descriptions. In such cases merely returning MSM with completion indicated is sufficient to close the job order

Lockheed Aircraft Corporation

FORM MSD 8339-1 MISSILE SYSTEMS DIVISION

MAINTENANCE SERVICE MEMO 24911

ASSIGNED TO: Joe Doaks — PRIORITY: A

DATE 9-26-56 TIME 10 AM

FROM John Smith

DEPT. 99-98 BLDG. 902

FLOOR 6 ROOM — COLUMN 16 PHONE 1226

MACHINE OR ITEM Mill - Hydrotel PROP. TAG NO. 64923

NATURE OF CALL: Stylus isn't operating properly.

CHARGE NUMBER 91223-33

REPAIRED BY J. Jones TIME START 10:20 STOP 11:30

" TIME START 12:00 STOP 3:00

TIME START ____ STOP ____

DATE REPAIRED 9-26-56 DOWN TIME 5 hrs TOTAL TIME ON JOB 4 hr 10 min

NOTES:* Adjusted tracer. Repaired tracer motor and replaced key in gear on Stylus. 360° but seems O.K. May have to adjust rate valves later

*FOR MACHINE REPAIRS. LIST MAT'L. & PARTS USED ON BACK OF THIS FORM.

MOORE BUSINESS FORMS, INC.

This is the Maintenance Service Memo or the MSM as it is called by Lockheed. It serves as a permanent record, time card and charge sheet

Cures 'Complexity Complex' at Lockheed

By WESTON C. COOLEY, Maintenance Foreman, Missile Systems Div., Lockheed Aircraft Corp.

WORK IN THE maintenance department of the Missile Systems Division of Lockheed Aircraft Corporation is done on authority of two forms only. This eliminates the numerous complex forms usually required to accomplish work and provides a simple and easily understood system which gives adequate records without being cumbersome. One of the forms used will be briefly described and the second form, the "Mighty MSM," will be described in detail.

To request any work of the Maintenance Department other than routine repair or maintenance, the requesting department initiates an "Expenditure Request" stating the nature of the request and the justification. This "Expenditure Request" is not one of the two forms referred to above.

After proper approvals are obtained, this request is forwarded to Plant Engineering. The request is then routed through the proper engineer where necessary design is performed, after which it arrives in maintenance in the form of a "Plant Engineering Shop Order," the first of the two forms.

Routine repair or maintenance is requested by phone call or visit to the maintenance office. These requests cover such items as repair and maintenance of machines, equipment, small tools, office machines, furniture, buildings, grounds, automotive equipment, and factory and office rearrangement; alterations; and temporary installations.

These requests are written on the Maintenance Service Memo, the "Mighty MSM", by departmental clerks. Three copies of this form are made for each call, a white original, yellow duplicate, and green triplicate. The requestor is asked to give complete information, indicating name, department, location, telephone number, machine number (where applicable), column number (where applicable), and nature of trouble. This information simplifies finding the area of trouble.

The accounting charge is placed on the MSM by the clerk, who then gives all three copies to the proper leadman. He, in turn, investigates the MSM to determine whether adequate information is provided to enable him to assign the call to the proper craftsman. He then holds the yellow and green copies and assigns the original to one of his men, noting the name of the man on the yellow copy.

How's the Job Going?

In case of machine breakdown, the leadman returns the green copy of the MSM to the office as soon as he has determined the extent of the breakdown and the estimated time the machine will be down. This enables his supervisor to keep a record of the status of repair of all machinery. For other than machine breakdown MSM's, the green copy is discarded as soon as it is received by the leadman. The yellow copy is kept by the leadman in his MSM control box shown in Fig. 2. In the rear compartments are the yellow copies of all MSM's that are currently being worked upon. In the front compartment are the original and yellow copies of MSM's not yet assigned to a craftsman.

When the MSM is assigned to a craftsman, he first studies it to determine the scope of the work and then gathers the necessary tools, supplies, and equipment and takes off on the job. Upon completion, he signs off the MSM, noting the time started and stopped each time he works on this particular job and the total time on the job.

Two additional facts are entered by the craftsman in the case of machine repair. One is the downtime. This is the difference in days and hours between the time the job is completed and the time the MSM was written. Twenty-four hours in the day are figured due to the fact that the machine could potentially run this number of hours even though customarily it may be used only on one or two shifts. The other fact noted on machine repair is the materials and parts used. These two facts enable maintenance to keep accurate records on machinery as required by the Army, Navy, and Air Force.

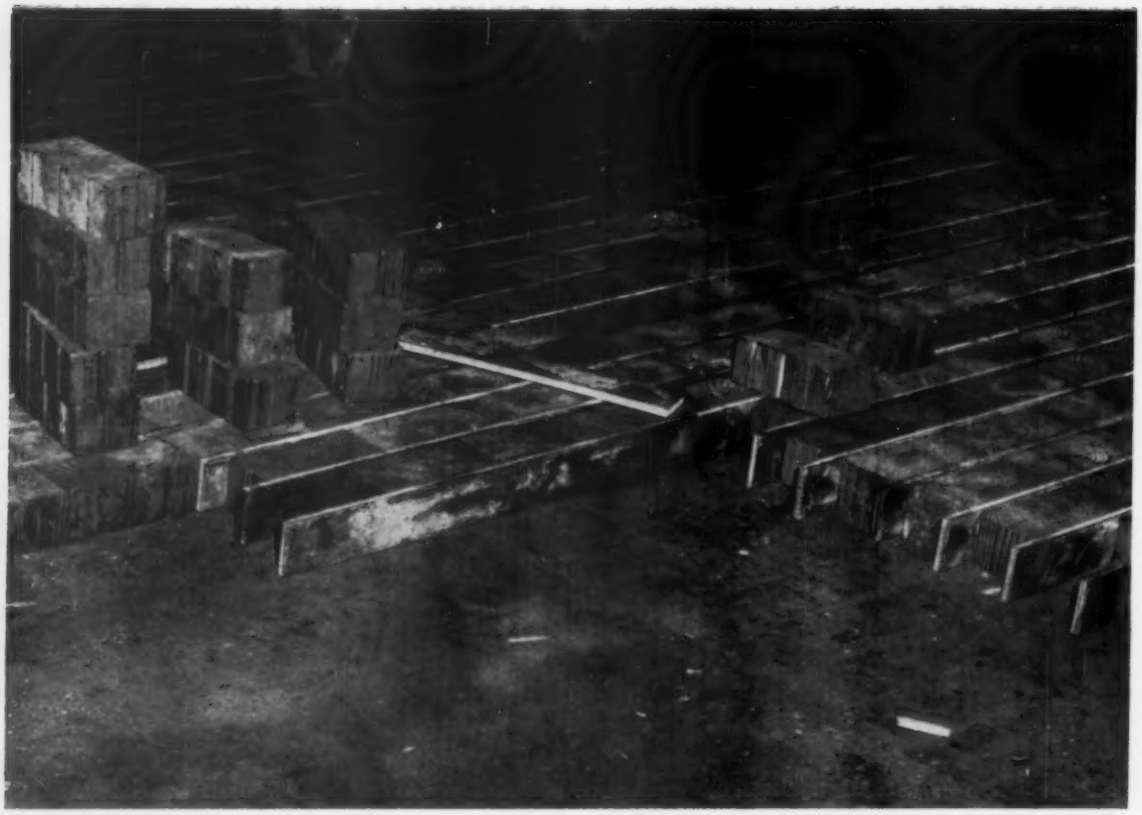
At the bottom of the MSM, each craftsman is required to explain what he did to complete the work requested on the MSM, if it is not adequately explained under "Nature of Call." If the call states merely, for example, "Arm loose on chair" and all the craftsman does is tighten the arm, obviously no explanation is required. However, if the call says only, "Machine broken," an explanation as to what was wrong and what was done to repair it obviously is needed.

When the MSM is completed, the craftsman returns it to the leadman, who checks it for completeness, and orders replacement parts for any parts used. In case of a temporary repair of a machine, he holds the MSM open until the parts for a permanent repair are received and then returns the MSM to the craftsman for the additional work. When the leadman is satisfied that all necessary work has been done, he initials the MSM as closed and turns it into the office.

Each completed MSM is scanned briefly by the appropriate supervisor who separates machine repair memos from the others. The others are filed numerically and kept for one year. The MSM's for machine repair are posted on the maintenance repair and inspection record of the affected machine and are then filed in the individual folder of the machine. Thus a permanent record is maintained of all work done on the machine.

Some advantages of the "Mighty MSM" are: First, it gives a complete record of all repair and maintenance performed during one year. Second, the MSM provides a positive method of accomplishing work with little chance of a slip-up. Third, it requires each craftsman to keep a record of the time spent on each job and gives his supervisor an opportunity to check his time. Last of all, it provides, in the case of machine repair, a permanent record in the folder of each machine of all work done on the machine.

This is how the yellow copies of the MSM are filed in the leadman's control box. In the front are the originals plus the yellows not yet assigned to a craftsman



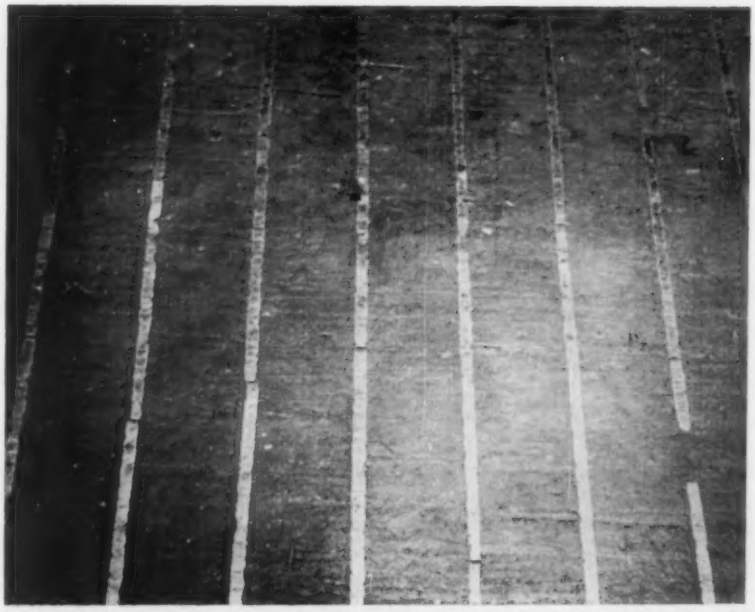
Installing new block and steel plates. Plate is laid so that tractor shoes contact more than one metal plate at a time.

Wood Block Flooring Life Upped 1400 Per Cent

WHEN YOU run tractors across a wood block floor you're apt to have some worn-out flooring. They did at Allis-Chalmers Manufacturing Company's Springfield, Ill. works where they make both crawler tractors and motor graders.

Tractors are particularly tough on the floor because the grousers on the track shoes dig into the comparatively soft wood, tending to shred or split the block. Excessive wear in certain spots on their plant floor where tractors were accustomed to turn necessitated replacement of the wood block in approximately 2 years.

So, they figured out an improved method of laying the blocks. New floor, and replacement floor, is now laid with steel plates between each row of blocks, as shown in the photo above. These plates are cut from scrap metal and may be from 3/8 in. to 1/2 in. thick, 3 in. wide and approximately 30 in. in length. Where possible, the plates are installed parallel to the flow of traffic to bring more than one plate in contact with tractor shoes.



This section of flooring has been subjected to tractor travel for about 7 years

10 Steps . . . To Industrial Survival

By Virgil L. Couch, Director, Industry Office, Federal Civil Defense Administration

TODAY, PRODUCTION everywhere depends on production somewhere else. Wreck one plant and production is stopped in another plant far away. With industry the prime target of an enemy attack, we need to develop measures that will safeguard America's industry, and, when necessary, enable it to absorb losses and dislocations.

Fig. 1. Powder extinguisher is shown at Jones & Laughlin Steel Corp.

The answer to these problems is civil defense, which can be defined in terms of objectives: 1. to increase the capacity of the country to survive under attack, and 2. to guarantee the ability of the country to carry on after attack.

The basic philosophy of civil defense is "self-help" in time of emergency. Every person, industrial plant, city and State must be prepared and capable of meeting disaster. This is a "Do-it-yourself" job in the true sense of the word.

In industrial plants leadership for self-help is already established—the owners and managers of the plant. The protective services in most instances are already established—fire brigades, guard services, rescue teams, and first aid and medical facilities. In preparing for attack or natural disaster, the need is basically that of creating a few additional services and enlarging and extending existing plant protective services. Large facilities, therefore, can prepare for civil defense through their existing organizational structure and by joining hands with community civil defense officials to establish committees and formulate programs in preparation for wartime and peacetime disaster *at the workplace.*

Owners and managers, in cooperation with employees, must plan and

organize for survival. Such plans must be tailored to meet the needs of each individual plant. It is also of vital importance that plans for plants be coordinated with those developed by local civil defense officials.

The principles and methods of civil defense preparedness outlined apply to every type of industrial activity.

Step 1. Self-Help

Self-help in industry is the organizing and training of small groups within a plant or other large facility for performing specialized services necessary to safeguard the building and its occupants in time of disaster.

The civil defense self-help organization is not expected to replace the normal plant protection organization or emergency forces. Instead, it is designed to help expand existing emergency and protective groups to meet large-scale disaster more effectively.

In taking this first step toward industrial survival the plant owner should:

1. Designate a plant Civil Defense Coordinator within each plant. The Coordinator should provide leadership in disaster planning for the protection of life and property at the workplace, and coordinate the plant civil defense plans and programs with those of the local community.
2. Establish an employee-management committee to give support and assistance in getting the job done in the plant. Employee-management committees already in existence may be used for this purpose.
3. Study and analyze the vulnerability of the plant, including its power systems and communications services. Existing data will be helpful for this purpose. By keeping continually informed about the factors that determine vulnerability the owner can plan his plant modernizations and expansion to reduce such vulnerability.
4. Make a survey of the buildings to determine needs for self-help and disaster control.
5. Establish a warning and communications system for plants. A plant control room should be set up with communications to the nearest civil defense control center.
6. Select, train and assign emergency protection personnel to such plant civil defense services as warden, police, fire, engineering, rescue, welfare, medical, and first-aid.

Persons in civil defense activities at the workplace should not be used for civil defense duties in the neighborhood of residence if such duties will conflict with their assignments at their on-the-job stations.

7. Provide equipment for first-aid, fire fighting, rescue and other emergency services.
8. Make a floor plan showing the location of fire extinguishers, first-aid stations, and other equipment.
9. Establish a damage assessment and reporting system.
10. Prepare a general traffic plan for quick movement of employees to shelters or to exits for evacuation.
11. Post directional and other informational signs, including evacuation instructions and shelter locations in corridors, hallways, meeting rooms, and other places of assembly.
12. Conduct emergency drills for moving employees to shelter areas or evacuating them to safe areas outside the city.
13. Work with other large industrial plants and facilities in the area in planning and training for disaster.
14. Keep in touch with the local Civil Defense Director to coordinate the plant civil defense plans and emergency service plans with the local civil defense program.
15. Put the plant civil defense plan in writing. Describe the purpose of the plans and the nature and responsibilities of each protective service, list the team leaders and members, outline the emergency procedures for each leader and team, show floor plans with shelter locations and evacuation routes, prepare alerting plans and directories, outline the training program for each service, and describe the records protection program and all other activities which are a part of the plan.
16. Be sure all employees know what the emergency procedures are and see that test exercises are conducted, including movement to the emergency headquarters and conduct of business under simulated attack conditions.
17. Urge all employees to prepare their families and homes for survival.

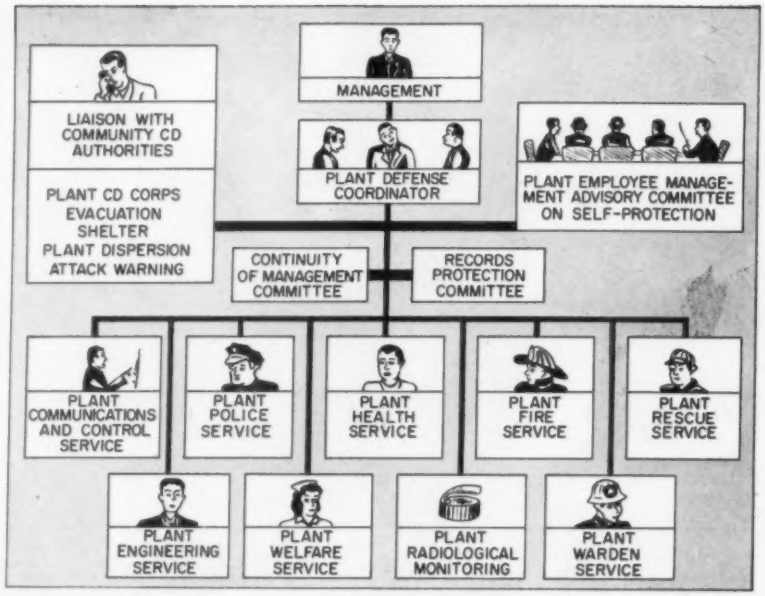


Fig. 2. Typical plant organization for Civil Defense as discussed in Step 1

Step 2. Evacuation

The movement of great numbers of employees from their workplace requires careful planning.

It should always be kept in mind that we never will have definite assurance of a specific amount of warning time. Therefore, we must be able to move fast when it is clear that there is sufficient time for evacuation.

At least one person should be designated on the staff of the Plant Civil Defense Coordinator to be responsible for evacuation planning. He should coordinate plant evacuation plans with local civil defense plans.

Plan priority of departure for operating and maintenance personnel in evacuation so that shutdown can be orderly and restoration of production quickly accomplished following attack.

In some instances local civil defense authorities may decide to encourage and assist the voluntary movement of children, mothers, and other priority groups out of danger areas in advance of an attack warning. This kind of

planning is of special importance in order that essential government and defense production workers may know that their families will be safe.

Step 3. Shelters

If there is not sufficient notice to evacuate the plant, the only alternative is to take shelter. There is still need for shelter from blast and heat effects on the fringe areas of damage and those not in the area of complete destruction. If notice is sufficient to permit partial evacuation, shelter from blast, heat, and initial radiation will be needed for those not able to reach areas at a distance from the point of attack. Even outside the areas of damage, shelter or cover from radioactive fallout will be needed.

Designate areas within the plant where employees may be temporarily protected from the effects of an attack. Such areas might include protective construction consisting of the alteration and strengthening of existing buildings and using protective features in design of new construction. Generally speaking, this consists of building deeper and thicker-walled basements, with thicker first floor decks, but location and the type of soil on which the individual building stands, will be the deciding factor. The aim is to reduce damage to structures and give partial or complete protection to occupants and equipment of buildings from the blast, radiation, and fire effects of an atomic explosion.

Step 4. Continuity

This is an important part of disaster planning, and includes the establishment of personnel succession lists, the selection and equipping of alternate company headquarters, the development of emergency accounting and auditing systems, and the establishment of emergency financial arrangements—those things that are necessary to provide managers and systems for the continuation of business after an attack.

Management must provide for skilled and technical supervisory staffs in line of succession. Arrangements must be made before attack to return employees to their jobs and to obtain additional employees through local employment services.

Step 5. Records

It is important that written descriptions of activities, manufacturing processes, engineering designs, and vital legal documents and accounting records be preserved and available to management following an attack.

Only records necessary to the continuing operation of the company and plants should be duplicated and preserved. Microfilm is one of the most commonly used means of providing duplicate records. Protective vaults should be provided at safe distances from the plant or facility, perferably at or near the alternate headquarters or alternate plant sites. Such protection might be provided by the adaptation of natural caves, abandoned limestone quarries which are reasonably dry, and abandoned coal mines in which air conditioning equipment, run by a standby generator, has been installed. Some companies have purchased, or rented space, in small banks outside what could be considered the target area. Arrangements for alternate headquarters might be made with small colleges, country clubs or other institutions.

Fig. 3. Microfilm unit (left) and vital records are stored safely underground

Step 6. Restoration

An important part of disaster planning, this consists of activities necessary to assess and repair damage and restore services, power, and production quickly. This step includes plans for the repair of the industrial plant, electric, gas and water services, and other vital facilities.

Important in civil defense planning is the selection of alternate plant sites and suppliers, maintenance of reserve stocks, programs of engineering construction, alternate equipment designs, and warehousing and inventory arrangements.

Planning for restoration of production or service should include such factors as the necessity to replace or repair damaged machines, and procure equipment; consideration to having contractors perform certain operations; and the development of alternate methods and use of substitute machinery.

The power industry can tie in with the National plan for emergency distribution of fuels and lubricants now being worked out by the FCDA and the Department of Interior. The fuel stocks of power plants will become part of the national inventory of fuel for essential services in time of emergency.

In wartime, many areas may be attacked at one time, and emergency repair crews will not be easily made available from other metropolitan areas. This means that each company must organize and train its own emergency repair crews in advance. Some companies are organizing emergency crews composed of skilled and semi-skilled workers from many sources.

Certain employees should be given definite assignments to report at a specified headquarters for duty as members of emergency crews for restoring power, communications, water services, and plant building and equipment.

Step 7. Security

Although action against sabotage and espionage is primarily the responsibility of the government, there are many steps which can be taken within industrial and utilities plants to reduce or eliminate the danger from such enemy activities.

Protective measures include fencing, protective lighting, guard or watch-

man services; investigation of applicants and employees and others for loyalty; pass and identification systems; safeguarding classified security information; and reports to the FBI of any suspicion of sabotage, espionage, or subversion.

Remember, investigation of suspected sabotage and espionage is the job of the FBI. What we are discussing here are the basic measures that can be taken in any industrial or utility plant.

Step 8. Mutual Aid

This is an organization of officials of a group of industrial plants or utilities in an area or community, united by a reciprocal agreement to provide assistance to each other in disaster in the form of equipment and personnel.

Although many industrial facilities have established excellent plant civil defense organizations, few can provide all of the resources needed to cope with a major emergency such as may result from enemy attack or natural disaster. Equipment of the best protected plants might be destroyed by the disaster. In addition, the services of the organized community protective forces may not be available to industry because of greater demands in the community. In most instances, therefore, industrial facilities must rely upon their own self-help organizations and equipment.

Many of the mutual aid groups have already catalogued their supplies of wire, cable, pipe, and critical items, so that each member firm knows what is already on hand.

Step 9. Deconcentration

Deconcentration is especially important to defense mobilization and production planning. It is an important factor in civil defense. Planning should provide not only relocation to other plants in other geographical areas of the key production of critical items, but also relocation of key departments of a critical plant or facility, including the management and technical offices.

Step 10. Dispersion

Dispersion of industrial plants for defense against attack is the employment of the simple military measure of using space for defense. Dispersion will create a great number of targets, thus reducing the vulnerability of any one concentration of industrial production. The National Dispersion Program is designed to encourage the dispersion of only the new plants and expanding industrial facilities.

SOURCES OF ASSISTANCE

The booklet, **"10 Steps to Industrial Survival"** is available from Federal Civil Defense Administration, Battle Creek, Mich.

Local Civil Defense Director—It's the job of the local Civil Defense Director to provide guidance and assistance in planning for industrial survival; to coordinate and direct local civil defense activities among public and private agencies or groups; to formulate and negotiate mutual aid plans and agreements with other communities; and to establish one or more secondary control centers to serve as command posts during an emergency.

Department of Commerce—to advise in cooperation with States, counties, and cities, in all phases of highway planning for emergency use; develop forecasts of radiological fallout patterns; and provide guidance and assistance on industrial dispersion.

Department of the Interior—to plan and direct Federal activities for procuring, transporting, storing, and distributing fuel supplies and power services.

Department of Agriculture—to plan and direct a National program for the protection of animals and crops against chemical and biological warfare; provide technical guidance to States on a food program for maintaining emergency food stocks in attacked or support areas; develop a National program for the prevention and control of fires in rural areas.

Department of Labor—to plan and administer programs on employment, deployment, and compensation of workers under civil defense emergency conditions.

Department of Justice—to provide technical guidance to States on the protection of penal institutions and the utilization of prisoners and prisons in an emergency.

Housing and Home Finance Agency—to aid in research and guidance on protective standards for new housing construction, temporary shelter in existing homes, provision of emergency housing in distressed areas, and the direction of Federal activities for the restoration of essential housing and facilities damaged by enemy action for which the Agency normally has legal responsibility.

National Organizations—Many national organizations, such as the National Safety Council, American Red Cross, AFL-CIO, the United States Chamber of Commerce, the Edison Electric Institute, National Petroleum Council, American Iron and Steel Institute, professional and technical magazines, and other groups are working actively in civil defense planning and are able to furnish information in their fields.

Publications—A great variety of publications, training aids, movies and film strips are available to assist in planning and organizing for industrial survival.

Many may be obtained from local and State Civil Defense Directors, or from the Superintendent of Documents, Washington 25, D. C., for nominal cost, and others from industrial and professional associations.

FCDA Technical Bulletin-16-3, "Sources of Reference and Guidance," gives a detailed list of reference publications.

Industry Defense-Training Conferences—These conferences, usually sponsored by the local Civil Defense Director or a local industrial, business, or civic group, are held to plan for the organization of industry defense efforts in an emergency.

FCDA Staff College Course—Industry Defense—A special course in Industry Defense is conducted at the National Headquarters of the Federal Civil Defense Administration in Battle Creek, Michigan. The five-day course is sponsored by FCDA's Industry Office and stresses in detail methods and techniques of planning, organizing, and preparing for self-help in industrial plants and other large facilities. There is no charge for tuition. Requests for information on dates and application for attendance should be sent to your local or State Civil Defense Director or to FCDA.

Skills Training Courses—Special training is available at the FCDA Rescue School, Olney, Maryland and through State and local civil defense sources. Such courses include (1) Civil Defense Emergency Operations, (2) Evacuation, (3) Radiological Monitoring, (4) Basic Rescue, (5) Advanced Rescue, and other courses of special interest to industrial emergency and disaster planners. Ask your local Civil Defense Director for details.

Don't Give Corrosion a Chance to Start — Watch:

1. Metallurgical Characteristics
2. Weld Characteristics
3. Effect of Minor Impurities

How Good Design Controls Corrosion

Part II. There Are Three Other Design Factors To Consider

By JOHN L. McPHERSON, Materials Engineer, Chemical Plants Division, Blaw-Knox Co.

ONE AREA WHERE corrosion can be nipped in the bud is in the proper design of plant equipment. Four factors of good design were discussed in the first article.* This article covers the remaining three factors which should be considered. These are: Metallurgical Characteristics, Weld Characteristics and Effect of Minor Impurities.

Metallurgical Characteristics — The metallurgical condition and structure of metals are often important when designing for corrosion resistance. Maximum corrosion resistance is afforded by a metal when it is in its most uniform or homogeneous condition. Generally, single-phase metals and alloys have greater resistance to corrosion than do multi-phase alloys. The presence of more than one phase can establish galvanic cells between two or more phases in a metal structure and initiate corrosion. Also, nonmetallic inclusions can serve as discontinuities in protective metal films to cause pitting corrosion.

Lack of homogeneity in metals and alloys at their grain boundries is often the cause of unexpected corrosion. This is especially true with the austenitic stainless steels, which are susceptible to intergranular corrosion.

Select Proper Heat Treatment

Always use caution when selecting heat treatments for metals, since improper heat treatment or cold working may produce undesirable phases that will cause corrosion. Heat treatments that break up the pearlitic structure of mild carbon steel and favor the formation of carbides at the grain boundaries, reduce the corrosion resistance of the material and increase its susceptibility to stress corrosion cracking in nitrate solutions. The ferrite immediately adjacent to the carbide is more anodic than the carbide and is therefore corroded preferentially.

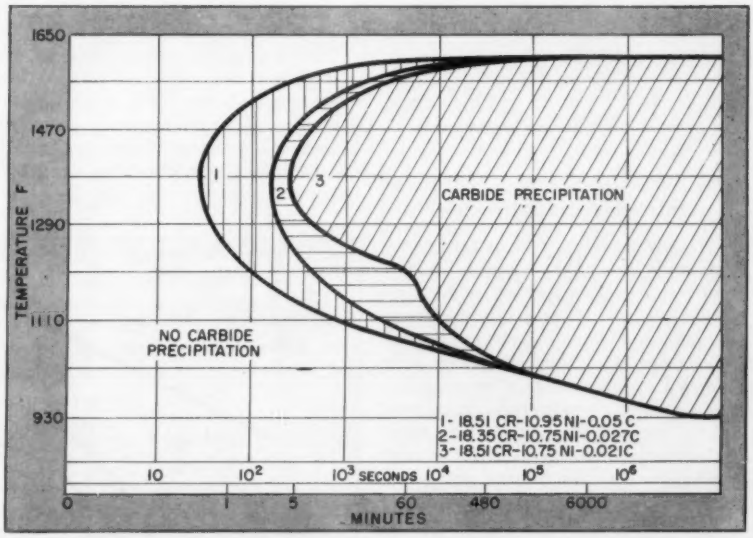


Fig. 1. Time-temperature precipitation curve for 18-8 stainless steel. Rate of carbide precipitation is a function of time and temperature as well as carbon content, and potential precipitation of chromium carbides follows C-shaped curve

Merely complying with a recognized code or legal requirement does not assure adequate corrosion resistance. One case where improper heat treatment destroyed corrosion resistance was encountered with a columbium stabilized AISI Type 309 stainless steel vessel handling nitric acid. The vessel was stress relieved at 1550 to 1650 F for two hours. This temperature satisfied the requirements of the ASME Unfired Pressure Vessel Code, but caused accelerated corrosion of the vessel during service because it favored the formation of a sigma phase in the alloy. If stress relieving had been done at a temperature of 1850 to 1900 F, the corrosion resistance of the vessel would have been entirely satisfactory.

The intergranular corrosion of austenitic stainless steels is the result of the metallurgical instability of these alloys when heated within the temperature range of 750 to 1500 F. The alloys most often affected are AISI Type 302, 304, 309 and 316 stainless steels which are inherently single-phase alloys consisting entirely of austenite. Austenite is a solid solution of carbide in gamma iron, the carbide being present under equilibrium conditions below its solid solubility limit.

When any of these alloys are heated within the sensitization temperature range of 750 to 1500 F, carbon separates from the austenite and unites with chromium to form chromium carbides along the grain boundaries. This action lowers the chromium content and reduces the corrosion resistance of the alloys in areas adjacent to the grain boundaries. The rate and amount

*See "Designing for Corrosion Resistance," PLANT ENGINEERING, January, 1957.

of chromium carbide precipitated, together with attendant reduction in corrosion resistance, depends upon many factors.

One of the major factors controlling carbide precipitation is the carbon concentration. Each weight unit of carbon will combine with 17 weight units of chromium to form chromium carbide. Therefore, lowering the carbon content should be beneficial in reducing chromium carbide precipitation and intergranular corrosion. Experiments have shown that the solid solubility limit of carbon in gamma iron is about 0.02 per cent at 1250 F. Hence, alloys containing not more than this amount of carbon should be safe from intergranular corrosion. Any increase in carbon content above about 0.02 per cent will increase the probability of intergranular corrosion. However, the rate of reaction is a function of time and temperature as well as carbon content, and the potential precipitation of chromium carbides follows a "C" curve similar to those in Fig. 1.

Intergranular Corrosion

The susceptibility of austenitic stainless steels to intergranular corrosion can be reduced or entirely eliminated in many ways depending upon the final application of the metal, and the service conditions for which it is intended. One way of assuring complete freedom from intergranular corrosion is to use the metal in the solution annealed condition. Solution annealing consists of heating the metal at a sufficiently high temperature, usually 1950 to 2000 F long enough to place all of the chromium carbides into solution. Then the metal is rapidly quenched in water to assure the retention of carbides in the austenite. This heat-treated condition is satisfactory for simple objects that do not require field welding or operation in the sensitization temperature range.

If the alloy is to operate within the sensitization temperature range, complete immunity from chromium carbide precipitation is required. This can be obtained by use of alloys stabilized with titanium or columbium or a combination of columbium and tantalum. The mechanics of stabilization can be explained by referring to Fig. 2, which shows solid solubility curves for chromium, columbium and titanium carbides in austenite. The curve AB represents the limits of solubility of chromium carbides in austenite while curves OC and OD represent the solubility limits for titanium and columbium carbides in austenite.

If an 18 per cent chromium, 8 per cent nickel alloy containing 0.08 per cent carbon, stabilized with columbium, is heated at 2400 F for sufficient time, all of the carbon will be dissolved in austenite in accordance with the solubility relations imposed by curve OD. Upon water quenching, all of the constituents are retained in solid solution.

Reheating the metal to 1800 F causes the carbon dissolved in the austenite to combine with the columbium to form columbium carbides until the carbon content reaches about 0.01 per cent, curve XY.

Now, if the metal is slowly cooled to 800 F, the solid solubility curve is followed along path YO. Since, at this point, the carbon content of the austenite grains has been reduced to the solid solubility limit, further heating at temperatures up to 1800 F will not result in further change in microconstituents of the alloy, and it is said to be stabilized.

Since the precipitation reactions involve only columbium and carbon, the chromium content of the material adjacent to the grain boundary was not changed, and the corrosion resistance of the alloy cannot be impaired by heating within the sensitization temperature range. A similar mechanism can be traced along curve OC for titanium stabilized alloys.

A note of caution, however, must be made concerning stabilized austenite stainless steel alloys. If, after solution annealing, the metal had been reheated to 1250 F instead of 1800 F, then both chromium and columbium carbides can form simultaneously as shown by curve ZY until a carbon content of about 0.028 per cent is reached. From this point on, only columbium carbides are formed and the reaction proceeds to completion as before except along curve ZYO.

In this case chromium carbides are formed and the material adjacent to the grain is reduced in chromium content and in corrosion resistance. This mechanism occurs sometimes during the welding of columbium stabilized stainless steel such as AISI Type 347. It results in corrosion identical to intergranular corrosion, but is called a "knife-line" attack since it occurs in a narrow band in heat affected zone of base metal adjacent to welds.

Intergranular corrosion is fre-

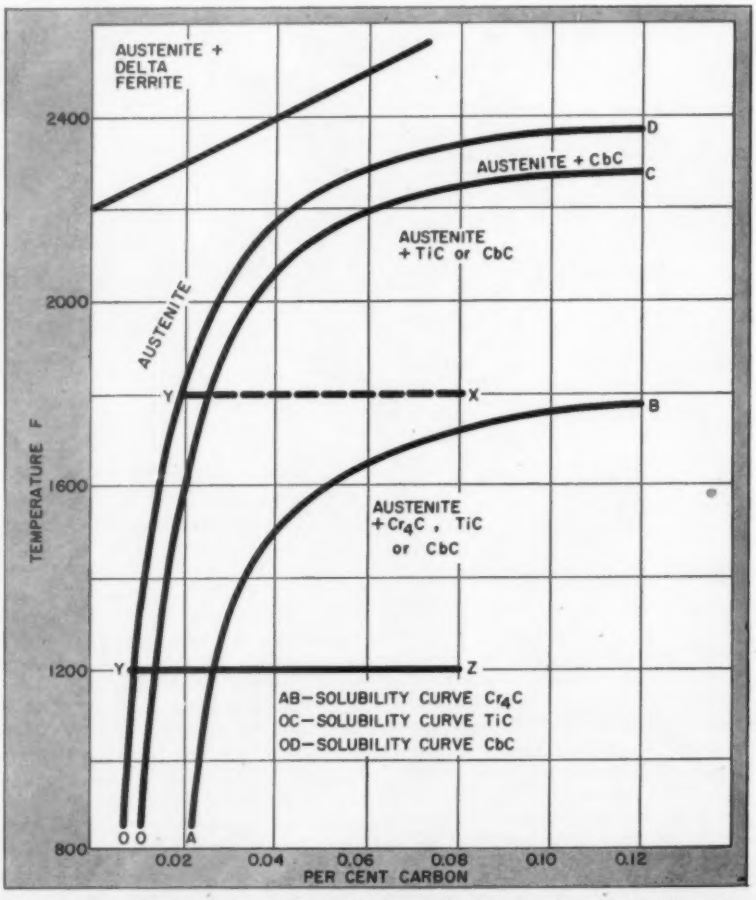


Fig. 2. Immunity from chromium carbide precipitation can be obtained by using alloys stabilized with titanium, columbium or various combinations. Curve AB represents chromium carbides; OC and OD are for titanium and columbium

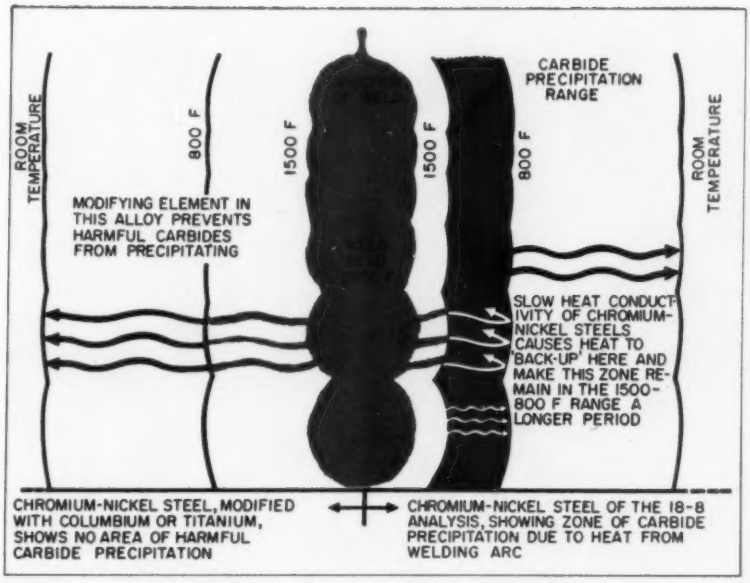

ROOM TEMPERATURE
800 F
1500 F
1500 F
800 F
CARBIDE PRECIPITATION RANGE
ROOM TEMPERATURE
MODIFYING ELEMENT IN THIS ALLOY PREVENTS HARMFUL CARBIDES FROM PRECIPITATING
SLOW HEAT CONDUCTIVITY OF CHROMIUM-NICKEL STEELS CAUSES HEAT TO 'BACK-UP' HERE AND MAKE THIS ZONE REMAIN IN THE 1500-800 F RANGE A LONGER PERIOD
CHROMIUM-NICKEL STEEL, MODIFIED WITH COLUMBIUM OR TITANIUM, SHOWS NO AREA OF HARMFUL CARBIDE PRECIPITATION
CHROMIUM-NICKEL STEEL OF THE 18-8 ANALYSIS, SHOWING ZONE OF CARBIDE PRECIPITATION DUE TO HEAT FROM WELDING ARC

Fig. 3. During welding there is a zone just out from and surrounding the weld which is in the critical temperature range. In this zone, chromium carbides can precipitate and cause intergranular corrosion. Stabilized alloys can prevent this

quently caused by welding and/or thermally forming or stress relieving of austenite stainless steels. During welding there always is a thermal gradient along the welded metal surface which ranges from the melting temperature of the alloy to the atmospheric temperature of the base plate, Fig. 3. There is a zone just out from and surrounding the weld in which the temperature is in the critical range of 750 to 1500 F for a maximum period of time.

In this zone chromium carbides can precipitate and cause intergranular corrosion. The use of stabilized alloys or alloys having a carbon content not in excess of the solid solubility limit (0.03 per cent for all practical purposes) will prevent intergranular corrosion resulting from welding, hot forming and stress relieving. Also, this type of material is not susceptible to knife-line attack.

Stabilized Alloys

Titanium stabilized stainless steel is marketed commercially as AISI Type 321, but it is not widely employed in the process industry since titanium cannot be transferred successfully through a metallic welding arc. Popular use of inert gas shielded-arc welding may lead to wider use of AISI Type 321 stainless steel, especially, when engineers learn more concerning its peculiarities.

Columbium stabilized stainless steel is commercially produced as AISI Type 347 and it offers complete immunity from intergranular corrosion when properly employed. A current shortage of columbium in the United States has forced the use of a combination columbium-tantalum stabilization. This combination behaves very similar to the straight columbium stabilization and no differentiation between the two need be made.

The use of stabilized austenitic stainless steels or alloys having a carbon content not in excess of the solid solubility limit, such as AISI Type 304L and 316L which contain 0.03 per cent carbon will prevent intergranular corrosion resulting from precipitation of chromium carbides during welding, hot forming and stress relieving.

Weld Characteristics—Welding is undoubtedly the most useful tool of fabrication and when properly employed can assist in the prevention of corrosion. In the welding of corrosion-resisting materials, a filler rod of the same chemical composition as the base material must be employed to retain the same inherent corrosion-resistant properties. The difference in physical structure between cast weld metal and wrought base metal is not sufficient to cause any significant change in corrosion resistance. Of greatest importance is the technique used to deposit the weld metal and to produce sound welds that are free of defects such as gas pockets, laps, undercutting, nonmetallic inclusions, micro-fissures and cracks which can impair corrosion resistance.

The type of welding process used in fabrication can affect the corrosion resistance of a weld. Automatic, submerged-arc welds in carbon steel appear to have less corrosion resistance than welds produced by the manual metallic-arc process. Where submerged-arc welding is used on thick-walled vessels handling corrosive fluids, the seams should be double-butt welded with the inside welds being made by the manual metallic-arc process. This combination of welding processes gives the best corrosion-resisting weld at the lowest cost. Thin-walled vessels which require welding from one side only should be welded in not less than three passes using the manual metallic-arc process.

Metals and alloys subject to structural transformations at temperatures reached during welding may suffer loss in corrosion resistance in the vicinity of the weld, and may require special control of the welding procedure and post-weld heat treatments. Welding techniques for corrosion resistance can vary from metal to metal but, in general, the use of small fast stringer beads is preferred to thicker deposits made by the weave bead technique. Stringer beads usually require less heat concentration and have less effect upon the structure of metals.

When welding stainless steels, nickel, Monel, Inconel and other corrosion resisting alloys, special tools should be employed in preparing the weld joint and cleaning the weld deposits to prevent contamination of the weld with foreign metal that might initiate galvanic-cell-type-corrosion.

Preparation of weld joints in stainless steel by powder burning may contribute to weld-metal dilution, and should be frowned upon unless the burned surface is removed to a depth of not less than 1/8 in. by grinding or machining. The gouging and cutting of low-carbon stainless steel with a carbon arc may result in increasing the carbon content of the base plate in areas adjacent to the weld joint and cause intergranular corrosion.

Remove Tack Welds

Tack welds used to position plates and other parts in preparation for welding should be removed by grinding or cutting prior to welding as these have been known to cause weld cracks. Also, weld craters should be removed and back welded, since they usually contain micro-fissures. A large number of weld failures are caused by small cracks that might normally be overlooked in other than corrosion-resisting service.

Butt welds in corrosion-resisting pipe and equipment must be complete penetration welds free of cracks, voids, undercutting and laps that might initiate crevice corrosion. Excessive underbead reinforcement in pipelines may interfere with fluid flow,

and create eddies that cause erosion corrosion.

The surface areas adjacent to welds should be cleaned of all weld flux, fume dust and weld spatter since these foreign materials can initiate corrosion.

Effect of Minor Impurities—The presence of minor impurities in a fluid or solution may increase or decrease the corrosion of metals. The presence of halogens, especially chlorides, is detrimental to the corrosion resistance of all metals and alloys that rely upon a passive film for protection. Chlorides have the ability to penetrate passive films and initiate pitting corrosion. Minor amounts of chlorides (a few parts per million) can also cause stress corrosion cracking of stainless steel.

Strong oxidizing chemicals, silicates and colloids added to inhibit corrosion can promote pitting attack if they are added in insufficient amounts. This is especially true when metals are used in borderline applications and poor control is maintained over the inhibited corrosive. However, the proper use of corrosion inhibitors can reduce corrosion and eliminate pitting attack by aiding in repair and maintenance of protective surface films.

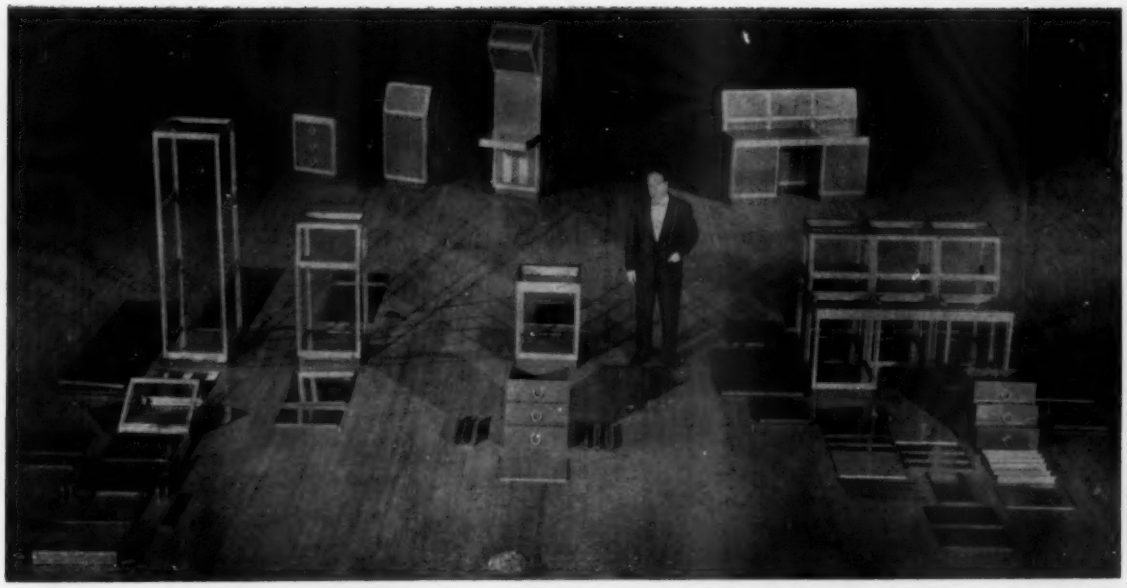
Presence or absence of oxygen in a solution can greatly affect the corrosion of certain metals. The presence of oxygen can assist in the depolarization of metal surfaces by chemically combining with hydrogen and thereby increase corrosion. Oxygen can also decrease the corrosion of such metals as stainless steel and aluminum by helping to form and maintain a protective oxide film. In general, aeration of solutions is beneficial in combating pitting corrosion of all metals except copper, copper alloys and Monel.

The addition of a foreign metal into a corrosive medium frequently causes pitting corrosion. This is especially true of aluminum which is near the top of the electromotive series and can displace most metals from solution. One example of pitting corrosion from this cause was encountered in an aluminum tubed condenser using cooling water from a private lake. After about one year of satisfactory operation, difficulty was had with algae and bio-fouling of the shell side of the condenser. To eliminate and control the growth of algae, copper sulfate was added to the water. Pitting corrosion immediately followed. Metallic copper deposited on the aluminum tubes, breaking down the passive film and establishing small electrolytic cells in localized areas. These areas developed into pits which eventually perforated the tube wall, Fig. 4.

In the design of structure and equipment for processing plants, considerations for corrosion resistance are secondary only to those for structural stability. For no matter what merit a design may possess structurally, it will fail to fulfill its usefulness if resistance to corrosion cannot be maintained throughout the desired service life. The plant engineer must at all times be cognizant of the various corrosive conditions existing throughout a plant so he can anticipate corrosion problems. Thus, he will utilize the most suitable materials of construction and employ proper design and fabricating techniques to control corrosion.

Fig. 4. Pitting corrosion in an aluminum tube of a condenser occurred when the cooling water was treated with copper sulfate to eliminate and control the growth of algae. These pitted areas eventually perforated the condenser tube wall

"Stopped by to tell you that you just made a splendid contribution to our scrap drive!"



All these cabinets, and many more, can be made from 75 building block components and 125 different sub-assemblies

For Instrumentation, Automation, Electronic Equipment

"Erector Set" Cabinets

AN INGENIOUS NEW method by which industry, selecting from 75 mass-produced "building block" metal cabinet enclosures and working with 125 different sub-parts, can work up infinite varieties of cabinets to house instrumentation, automation, electronic, and electro-mechanical equipment, has been announced.

Industries already using the novel cabinet system include aviation, electronic, petro-chemical, heavy manufacturers employing automated control equipment, and the auto manufacturers. Multi-million dollar computers and elaborate electronic brains are also going into the modular units. Other industrial applications range from housing burglar alarm controls, to automatic paging systems, to public utilities control equipment.

With the rapid growth of the electronics industry, and the extension of instrumentation and automatic control techniques into plants in all production fields, it was found that the one major bottleneck was the lack of appropriate enclosures which could be swiftly produced, at low cost, with the quality required consistent with the delicate and expensive equipment industry was using.

Merely by drawing parts out of stock, finished cabinets in wide varieties of shapes, sizes, and models can be constructed by screwing together different tops, backs, sides, and fronts to the basic modular steel framework skeletons.

Airplane-type construction is used in the skeleton frames. Panel mounting holes are punched automatically in long sections so that the entire interior of each frame is ready to take endless varieties of "skins." Forty different types of panels, four different size drawers ranging from 7 to 14 in. high, and 16 in. deep make up the component parts which can be fastened to the frames.

Writing desk tops, sloping front consoles, extended arm cabinets and turret panels can be provided, as well as units for television monitoring. Readily available in stock are heavy-duty industrial finish Formica writing tops, desk panels, and Plexiglas tops designed to protect and display memory boards or circuit diagrams for easy reference by the instrument operator.

Frames may be bolted together side to side, front to back; they may be stacked one on top of another; or they may be assembled in combinations. In stacking, the components can be built to reach 81 in. in height; the smallest units measure 21 in.

All panel openings in the frames are designed on the 19 in. standard communications module. Maximum fastening strength and ease of installation of the panels are insured through the use of Tinnerman speed nuts, and Phillips head screws. The assembly technique has been further streamlined by eliminating conventional cup washers and replacing them with ornamental head screws with undercut heads.

Built of cold rolled, heavy gage steel, and finished in a two-tone gray baked enamel with a Bonderite base, the cabinets have been designed to meet nuclear decontamination requirements and have high air venting characteristics. They coordinate well with plant interiors and other electronic, automation and instrumentation equipment.

To complete the cycle of economy in time and delivery, not only are the components ordered from stock, but all sub-assembly work is done at the factory with all panels bolted in place, and drawers, and doors inserted. Companies and engineers ordering the units merely have to bolt together the over-all assembled components.

According to the manufacturer, one of the more elaborate consoles, factory sub-assembled from 30 component modules, sells for $600; a comparable custom-built model of the same type would cost over $1,500. The smallest unit, a 13-in. instrument cabinet sells for $24.

Outdoor Storage Problem?

How About a War-Surplus Railroad? Douglas Aircraft Finds One Is Handy

By R. T. BRUNO, General Foreman, Tool Storage and Tool Control
Torrance Facility, El Segundo Div., Douglas Aircraft Company

USING CERTAIN types of war surplus materials to come up with something new and different has become a habit of the Plant Engineering Department at the El Segundo Division of Douglas Aircraft Company. The company's huge, new Torrance, California facility, for instance, now one of the nation's largest and most modern airplants for producing Naval military airplanes, was converted from a wartime aluminum plant.

When it came time to set up a tool and jig storage yard for this new facility, the Plant Engineering Department once again reached into the war surplus grab bag.

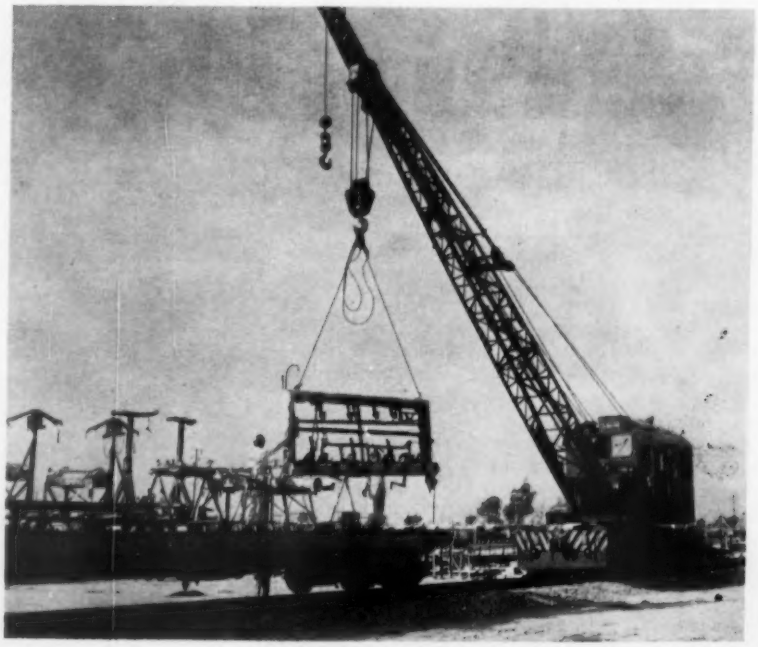
Tool and jig storage is always a big problem at an airplant. Model changes are frequent, and the tools used to produce prior models must be kept on hand and readily available to produce extra parts and spares when and if they are needed.

About 75 per cent of the tools and jigs in storage are inactive, pending an emergency. The other 25 per cent are active tools, moved in and out of the plant at frequent intervals to produce the relative short production runs characteristic of airplane production. Finally, ample tool storage space must be provided for a flood of incoming tools and jigs from subcontractors at the expiration of each production contract.

At the Torrance facility, approximately 25,000 tools and jigs are in storage at any one time. With the storage set-up currently in use, any tool can be located and scheduled for delivery into the plant in five minutes. Deliveries are made three times each day.

At the start, about 37 acres of space were available for tool and jig storage. Eight and one-half acres were set aside and hard surfaced for the storage of small jigs and equipment. But when it came time to hard surface the remaining 28½ acres, the Plant Engineering Department looked around for a less costly way to achieve the desired results.

Fig. 1. Heavy wing-section jig is loaded onto flat car towed by self-powered crane



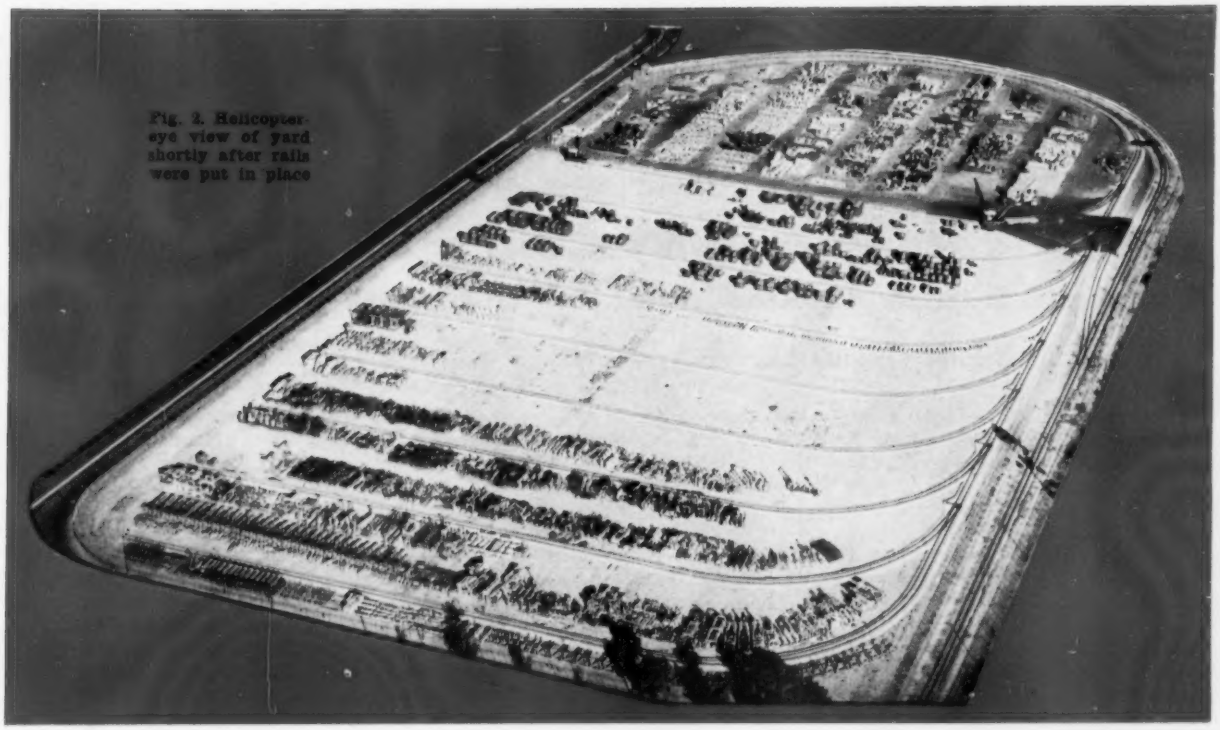


Fig. 2. Helicopter-eye view of yard shortly after rails were put in place

Investigations revealed that surplus diesel-powered Navy railroad cranes and surplus flat cars were available. Surplus rail stock was also available. Trackmobiles that could operate either on rubber tires or rails by hydraulically raising or lowering the correct set of wheels would solve the motive power problem. And most important, because it would not have to support heavy trucks if rails were used, the 28½ acre storage lot could be gravel-surfaced instead of hard-topped. The savings would more than pay for the surplus equipment.

Surplus railroad cranes obtained in this manner have a 65 ft boom and are capable of handling the heaviest tools at a low boom angle. Power for the crane, and power to move the flat car on which it is mounted, is obtained from a single diesel engine through a gear-shift system. The crane remains in the storage yard and is used to load or unload the five surplus flat cars as they move tools and jigs into and out of the plant.

Fig. 3. View along one rail spur in yard shows multiplicity of tool types stored

Nine rail spurs intersect the main storage yard at 120 ft intervals. The 65 ft crane boom can span this 120 ft space from one or the other of any two tracks. The nine storage yard spurs all switch onto a main track leading to the plant proper. At the plant, three additional spurs switch off from the main track and lead into three different in-plant locations strategically located to minimize in-plant tool and jig handling between the flat cars and the factory location of the tool.

As a final convenience, this Douglas plant-wide railroad system can be switched into either of two large public railways systems—the Santa Fe, or the Pacific Electric Railway System.

As already indicated, the flat car train, towed by the Trackmobile, makes three scheduled trips daily between the storage yard and plant. This schedule is a part of the tool control system that makes it possible to locate any tool almost instantly, and that maintains complete data on the tool

(Continued on page 194)

Electrical Ground System—57 Ft Down

Test Borings, Instruments Eliminated Hit-or-Miss Job

By C. J. BUICE, Engineer, Factory Planning, Western Electric Co.

TOO OFTEN WE are inclined, when asked to provide a ground, to drive a 10-ft or 20-ft copper rod in the earth, and assume that we have a good ground. After a check of our soil condition at the Lexington Road Plant of Western Electric Company, we decided this assumption would not be correct.

From test boring data, we knew that a low resistance ground would be quite difficult to obtain due to the soil composition. The soil consisted of sand, decayed rock, disintegrated rock, disintegrated mica schist, decomposed mica schist and micaceous sand, all very poor electrical conductors. In view of these circumstances, we decided upon deep driven ground system, which is the most simple and most economical method of reaching the strata of better conducting soils.

An added advantage of this system, where rods are driven to a maximum depth, is that a penetration into a permanent moisture level of the soil would provide a more stable condition the year around. The change in resistance to ground, due to seasonal variations in rainfall, is greatly minimized.

In preliminary tests on a temporary ground installation, two ground electrodes, composed of 10-ft sectional ground rods, were driven to a depth of approximately 70 ft. The driving area contained approximately 20 ft of fill. Final tests on the two individual electrodes at the maximum depth produced readings of 90 and 105 ohms to earth, respectively. The two electrodes were then tied in parallel with a resultant reading of 58 ohms. The reading was still considered high in that our original design criterion was 5 to 10 ohms to ground.

At this point it was decided to treat the area immediately around the rods with salt. Trenching around each rod to a depth of approximately 2 ft and filling with rock salt, the area was thoroughly soaked for several days and a final reading of 22 ohms was recorded. Although the result was more encouraging, we felt that we could further lower the resistance without the use of salt by using more electrodes and installing the new system at a lower elevation. This was borne out in the final results.

Readings for both the test and permanent installation were obtained by the use of two separate instruments, one a Megger ground tester made by the James G. Biddle Company of Philadelphia, Pennsylvania; the other a Groundometer of the Borden Engineering Company of New Providence, New Jersey. The Megger ground tester employs the a-c fall of potential principle and the Groundometer employs the Wheatstone bridge method of checking ground resistance.

Both instruments are used with auxiliary reference ground probes, and are so arranged that the scale reading is a direct reading of the resistance to earth of the electrode under test. Therefore, the resistance of the reference probe is not reflected in the direct reading, the range of resistance of the probes effects only the sensitivity of the instrument.

During installation of this particular system, we were asked to keep it completely isolated and clear of all other building grounds and the building itself. A spot was chosen approximately 67 ft from the rear of the building and 20 ft from the nearest underground sewer line. The area as chosen for the installation is approximately 20 ft lower than the original test spot and in a location which is a natural drainage from the surrounding areas.

For this reason, the idea of treating the ground system was abandoned as undesirable for future grass seeding, and also due to subsequent retreatment, as required by treated systems, over a period of time. Preliminary tests showed that the soil resistivity ranged from 50,000 to 300,000 ohms per centimeter cube.

Multiple Electrode System

These readings varied from a low of approximately 100 ohms to 600 ohms to ground. We proceeded to design a deep-driven, multiple-electrode system consisting of ten rods with a 20-ft spacing. This spacing was chosen to provide a maximum conducting path for each rod, the resistance decreasing with an increase in spacing for parallel rods.

Copperweld section rods 10 ft by ⅝ in. manufactured by the Copperweld Steel Company of Glassport, Pennsylvania, were used and were tied together with 4/0 bare copper, connections being made with Burndy ground clamps. The rods were coupled together and brazed with readings recorded for every section. The brazing was done to prevent the loosening of sections due to the vibration of the jack hammer.

Test rods also produced voids in the earth due to the large diameter of the coupling, and in order to compensate for this, a 2-ft trench was dug between

Table I. Resistance readings in ohms taken for individual rods at varying depths

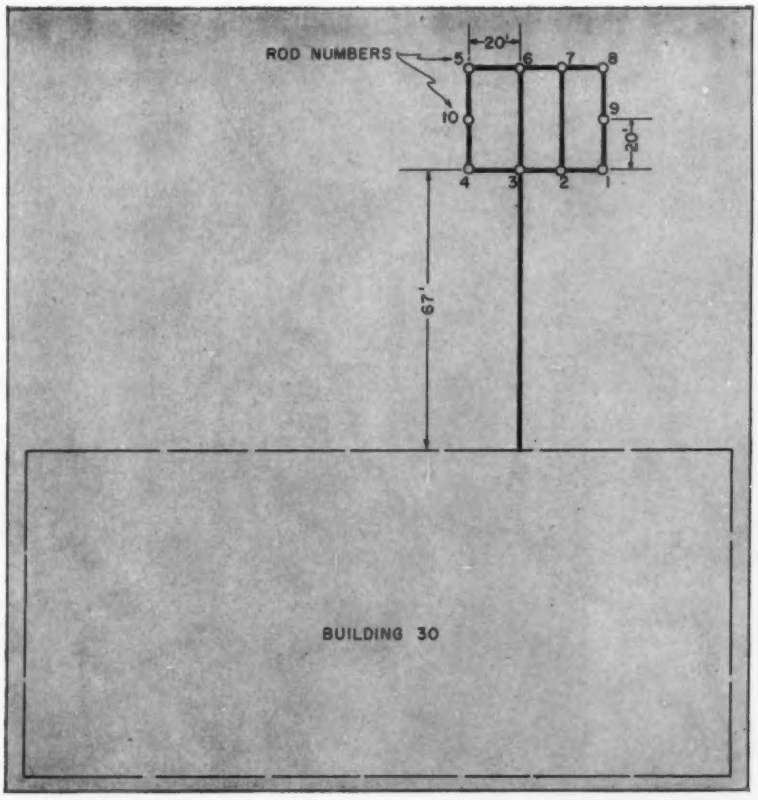
Depth of Rod Feet	Rod 1	Rod 2	Rod 3	Rod 4	Rod 5	Rod 6	Rod 7	Rod 8	Rod 9	Rod 10
10	550	800	860	340	860	990	690	410	670	390
20	320	380	415	220	790	325	165	185	220	230
30	90	120	280	130	230	91	94	125	130	135
40	50	48	153	76	135	56	60	82	80	90
45		36						76	70	
50				57	89	46	42			65
57				47						

Table II. Resistance readings for rods parallel connected in 10 combinations

Rods Connected	Reading in Ohms
No.	
1	50
1, 2	26
1, 2, 3	24
1, 2, 3, 4	18.5
1, 2, 3, 4, 5	17
1, 2, 3, 4, 5, 6	14.5
1, 2, 3, 4, 5, 6, 7	14
1, 2, 3, 4, 5, 6, 7, 8	13.5
1, 2, 3, 4, 5, 6, 7, 8, 9	11.5
1 through 10	11

rods, and the whole system flooded upon completion of the installation. This, along with continuous filling while driving was in progress, helped to minimize the void, thereby further decreasing resistance.

The results of this ground system are shown in Tables I and II with individual readings for each rod as driven to its maximum driving depth, and also the readings that were obtained as the rods were paralleled. The final reading of 11 ohms to earth, with all rods in parallel, as shown in Table II, gives us the most economical ground installation available for the conditions that prevail at this location.



This shows the patterns of rods and connections for the finished ground system

From "Casual" to Continuous Maintenance Pays Off

FROM A fifteen-year-old policy of casual building maintenance to a new continuous-maintenance program with new emphasis on plant appearance has proved an easy and profitable step for the Brunswick Pulp and Paper Mill. Members of Brunswick's management group initiated the continuous plan after comparing their weathered Georgia plant with the spick and span buildings of neighboring Dixie Paint & Varnish Company, Inc.

Chief problem facing the new plan was to find paint that would hold on wood and corrugated asbestos siding in spite of adverse conditions. Clouds of heavy, irritating fumes ordinarily blanket the mill area, which itself is located in a marsh on the banks of a salt water river. Free chlorine, hydrogen sulfide and sulfur compounds that form acids in the moist air continually stain and corrode any exposed surfaces.

Checking at the Dixie plant, Brunswick officials found that the paint company had used single coats of Duraflex, a water-based acrylic latex paint, based on an acrylic emulsion supplied by Rohm & Haas Company.

Only preparation made on Brunswick buildings prior to painting was through wire brushing to remove all loose dust and dirt. According to the maintenance superintendent, several weaknesses in equipment and pipes were discovered during this cleaning, thereby preventing some costly breakdowns. In one case, expensive stainless steel pipe running through an area being prepared for painting was being damaged by faulty brackets. Plant officials estimate that thousands of dollars worth of damaged pipe was found in time to prevent a breakdown.

Even very dark and stained roofs and walls were covered with a single coat of the acrylic paint.

Single coat of paint covers stained and darkened interior of this Transite roof deck

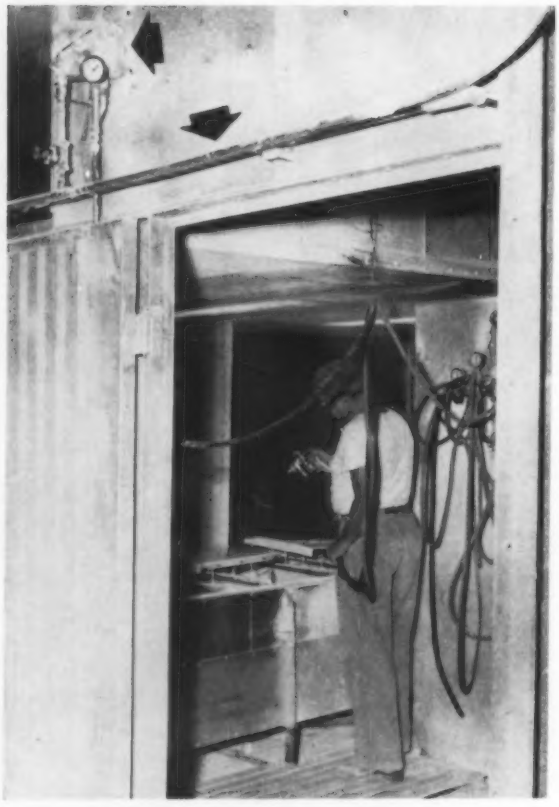


Fig. 1. One of the three spray booths supplied with enamel. Section of supply line and regulator are indicated by arrows

Hotpoint Saves $10,000 Annually By Piping Enamel To Spray Booths

COSTS HAVE BEEN cut appreciably by piping vitreous enamel to three spray booths at Hotpoint's electric range plant in Chicago. Former system was to load the enamel into portable pressure tanks and cart them to the booths on lift trucks.

The new system, engineered by Binks Manufacturing Co., is operating so well that, within the next few months, supply lines will be run from the mill room, where the enamel is prepared, to several additional spray booths. Based on experience to date, company officials believe they will save enough on labor costs to pay for the installation in three years.

Before the new supply line was installed, all enamel was loaded from the mill into 60-gal portable stainless steel tanks. Prior to being loaded, the tanks had to be washed. Then, after the enamel was in, additional time was consumed bolting the top of the tank, testing for air leaks, and affixing a batch-identity tag. The whole job took an average of 32 minutes per tank. Transporting each tank from the mill room to the spray booths required an additional 26 minutes.

The three booths processing range flatware used approximately four tanks a day. Thus, a total of nearly four hours a day was consumed in loading and transporting the enamel. On an annual basis, this would cost approximately $1,500. In other words, that much expense has been eliminated by piping enamel to the three flatware supply booths instead of transporting it in portable tanks.

The supply line now in operation is fed from two stainless steel tanks, mounted on a platform above the mill room floor. Each tank holds approximately 125 gal of prepared enamel, which is fed into the line as needed. The pressure required to push the enamel through the line comes from two air-actuated, gravity-fed diaphragm pumps, attached to the supply line just below the tanks.

A ¾ in. stainless steel supply line, which has a total length of about 500 ft, runs past each of the three spray booths. Outside each of these booths is a regulator, which acts in conjunction with the spray guns that supply enamel to the work. The regulator, in effect, is a valve that draws enamel out of the supply line and sends it, at a uniform rate of pressure and flow, through a

Fig. 2. One of the portable tanks formerly used to supply the spray booths

connecting hose to the spray gun in each booth.

Only a percentage of the enamel flowing through the supply line at any one moment is funneled into the spray guns. The remainder flows through the return half of the supply line back into one of the two stainless steel tanks. The enamel in the tanks recirculates constantly, and as the spray guns use up the supply, more is added from adjacent storage tanks.

Piping is now being installed to serve three more spray booths. There are three spray stations in each of these booths. One booth processes cooking range bodies; another handles the top of the range; and the third sprays the backsplasher.

These three spray booths, soon to be connected to the mill room via additional enamel supply lines, are currently using a total of 16 portable tanks a day. Officials estimate that when these installations are completed, savings will total nearly $10,000 a year. Included in this figure is approximately $600 for maintenance of the lift truck used for the tank-transportation trips.

Hotpoint has a highly efficient system for manufacturing the enamel that is used in its spray booths. Raw materials—consisting mostly of frit, clay, silicon, borax and cobalt—are kept in a second floor storage area above the mill room floor. After the materials needed to make a given batch have been weighed in the storeroom, they are gravity-fed through floor hatches and transported through flexible hose to each mill, where the enamel is actually made. Seven of the mills are rated at 5,000 lb, two at 300 lb, and one at 600 lb.

After water has been added, the mill begins grinding up the frit and other ingredients. Six to eight hours later, the finished batch of enamel is ready.

Fig. 3. O. J. Arness, process engineer in the plant's finishing division, checks the vitreous enamel level in one of the two tanks that feed the supply line

A pump, powered by a 1 hp motor, is used to transport the enamel from each mill into storage. There is a total of 19 storage tanks—17 of 1200 gal capacity, and two of 600 gal capacity. These storage tanks feed the two stainless steel containers that keep the supply line filled. Another pump, similarly powered, moves the enamel from one set of tanks to the other.

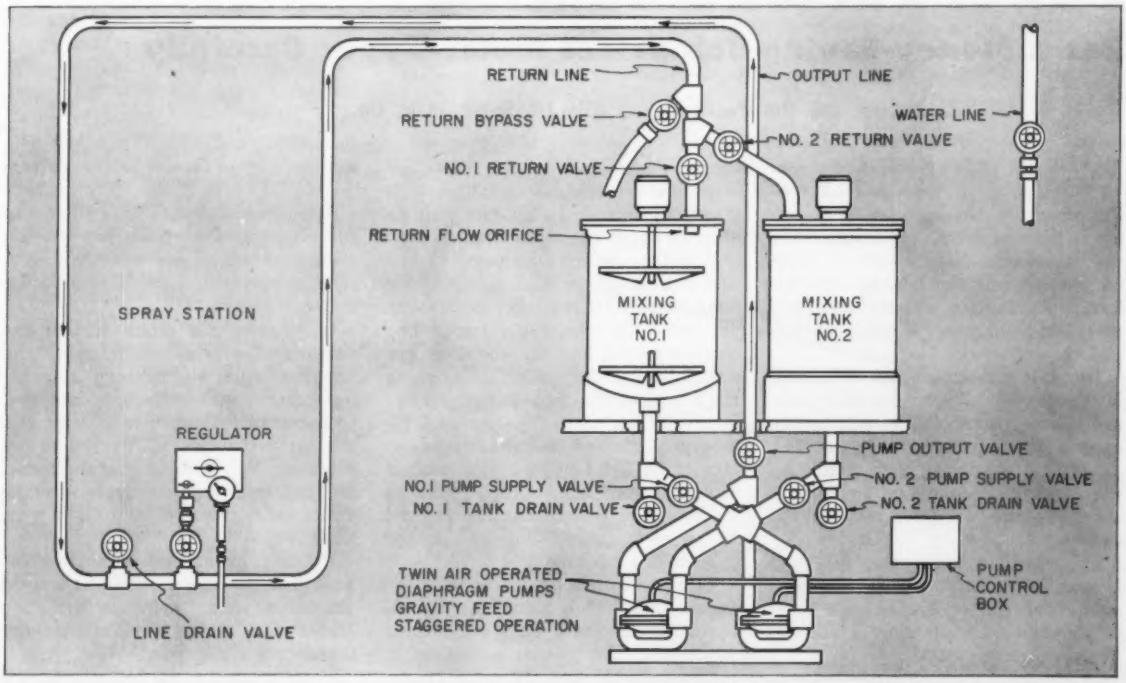


Fig. 4. Diagram shows the circulating system used to supply enamel to the spray booths. The company will equip three more spray booths with this system, and will save enough on labor costs to pay for the installation in three years

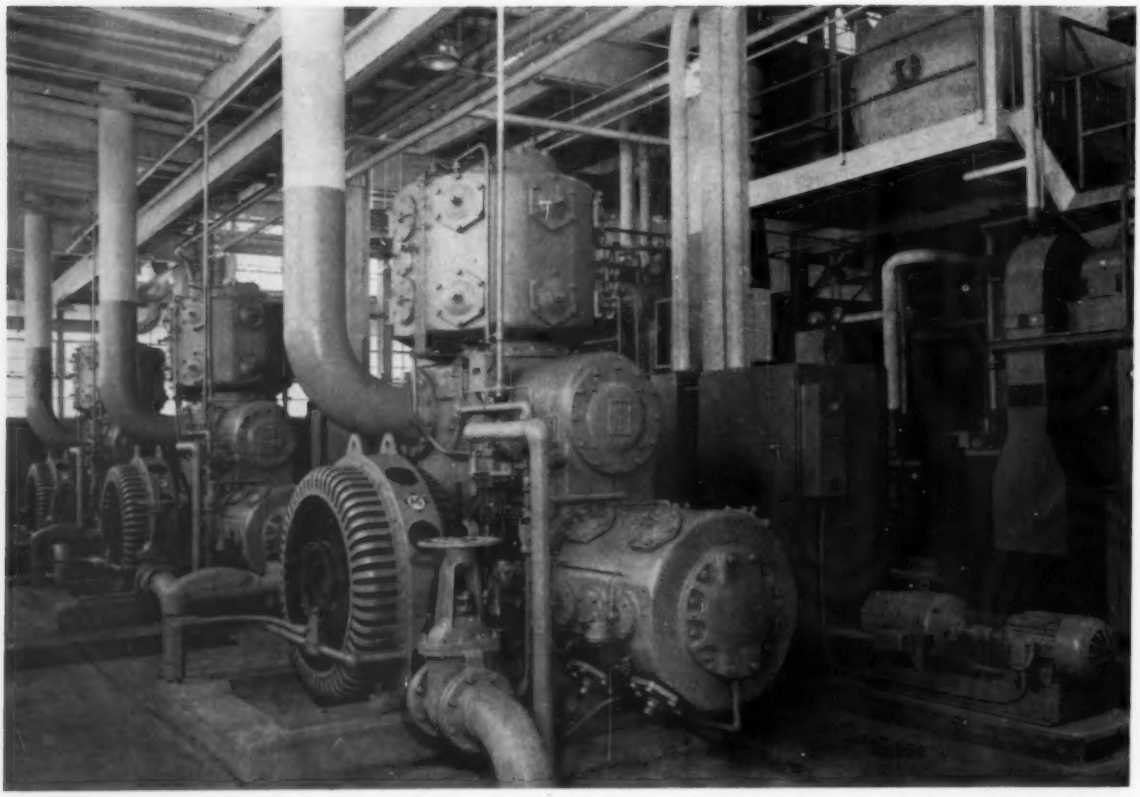


Fig. 1. Synchronous motors drive air compressors, correct plant power factor; individual m-g sets provide excitation.

Power Factor Balancing—

For a Money-Saving Job Select Motor Types Carefully

By E. N. GIGOT, Motor and Generator Dept., Allis-Chalmers Mfg. Co.

WHEN PLANNING a new plant, an expansion or modernization of an existing plant—or even the replacement of equipment—substantial savings may result if drive motors are selected to balance the leading and lagging power-factor loads on the in-plant power distribution system.

If maximum economy is to be realized during the life of the equipment, initial drive motor cost is only one of several factors that must be considered. The cost of operating each motor and the effect of each motor on in-plant system power factor must also be considered.

Since electric power companies have greater line losses when supplying poor power-factor loads, some form of power-factor evaluation is included in their rate structures.

When loads are balanced to improve power factor, both the power company's system and the in-plant distribution system benefit. Feeder line losses and transformer losses are substantially reduced. In addition, voltage drop through this equipment is lowered and its capacity increased.

For example, a load power-factor improvement from 75 per cent to 95 per cent will reduce the feeder line current to the load by about 21 per cent, a figure derived by subtracting the ratio of the two power factors from 100 per cent. System capacity is increased and voltage drop decreased by like amounts. Distribution feeder losses, being proportional to the square of the current, are reduced by an even greater amount—36 per cent in this example.

Often power-factor correction can be accomplished economically by the use of synchronous motors and static capacitors. For plants requiring at least one motor rated 50 hp or larger, proper selection of a synchronous motor can often be the most economical method of power-factor correction.

Synchronous motors have additional advantages at low speeds and provide a simple means of power-factor adjustment if operated within motor rating limits.

By varying the direct current excitation on a synchronous motor the vector relationship between alternating current and voltage is changed. Changes in loading also change this angular relationship. The typical V-curves in Fig. 2 show how the armature current of a synchronous machine varies with changes in excitation or load.

For any given load within the capacity of the motor, there is a field excitation value at which armature current is minimum. This is the unity power-factor point.

With greater excitation current, the machine is considered overexcited, and with less excitation it is con-

sidered underexcited. These are handy terms to use in discussing reactive control on a power system.

Overexcited synchronous motors, overexcited synchronous generators, and shunt capacitors supply reactive power to the system. On the other hand, induction motors, transformers, and other inductive loads are considered underexcited, since magnetizing currents are absorbed by this class of equipment. Balance is achieved when the overexcited elements of a system balance out the underexcited elements.

Most synchronous motor drives operate with field excitation set for a rated power factor, usually 80 per cent leading when corrective effect is desired. Where maximum efficiency is desired and there is no need for corrective capacity, synchronous motors usually have a 100 per cent power factor rating.

Synchronous motors designed for power factor ratings between 80 and 100 per cent are seldom used because their corrective effect is less but their cost is the same as 80 per cent pf machines. Motors designed to supply larger amounts of reactive power (60 or 70 per cent for example) are also seldom used because they are more costly and less efficient than 80 per cent pf motors.

The fact that synchronous motors provide increased reactive power at part load is a consideration in evaluating their corrective effect. Conversely, overloading reduces their effect in kvar balancing. Since drives almost always operate at something less than full motor horsepower ratings, except for intermittent or emergency periods, this normally is not a problem.

Set of curves in Fig. 3, showing the kvar available for any given percentage load on a synchronous motor, applies only when the field excitation is set for the rated power factor of 100 per cent, 90 per cent, or 80 per cent at rated horsepower.

Note that overloading the 100 per cent pf motor causes it to operate at lagging power factor and absorb reactive kva, just as an induction motor does.

The standard 80 per cent pf motor is flexible enough to operate at unity power factor when kvar requirements are down. However, because pull-out torque is decreased in direct proportion to reduced excitation, a substantial reduction in line voltage or a suddenly applied load can cause the motor to pull out of step.

If high pull-out torque is required, an 80 per cent pf synchronous motor is usually applied. The high internal voltages and high field strength required for high pull-out torque are the features stemming from its design.

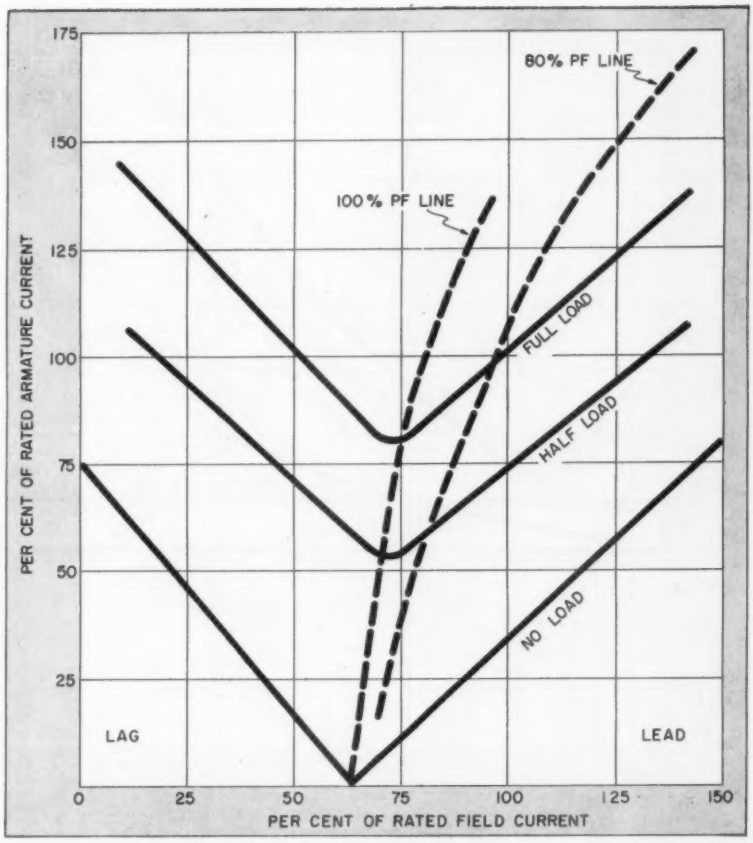
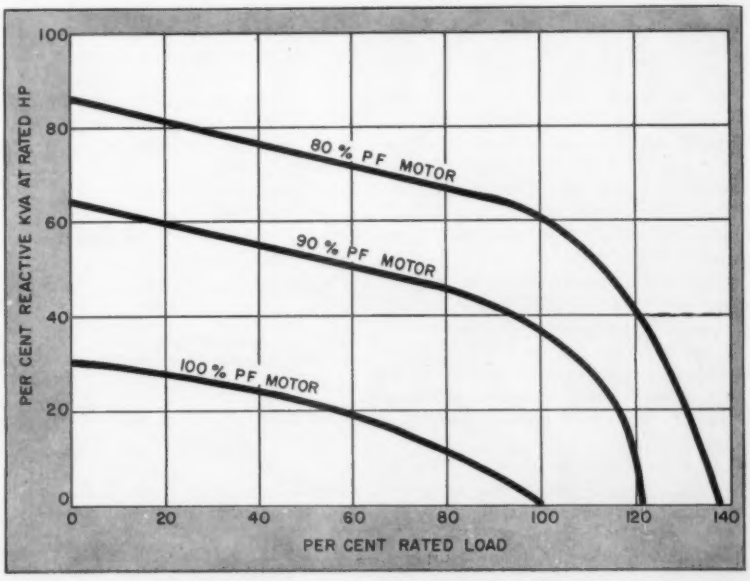


Fig. 2. Typical V-curves for synchronous machine field and armature currents

Rubber mill Banbury mixers and pulp mill log chippers typify the widely fluctuating loads to which high pull-out torque motors must be applied. Both of these applications normally use motors with 250 per cent pull-out torque, and the load cycling on each is such that momentary loads of close to two and a half times motor rating frequently occur. When synchronous motors are applied to drive

Fig. 3. Synchronous motors' kvar available at various loads for pf balancing



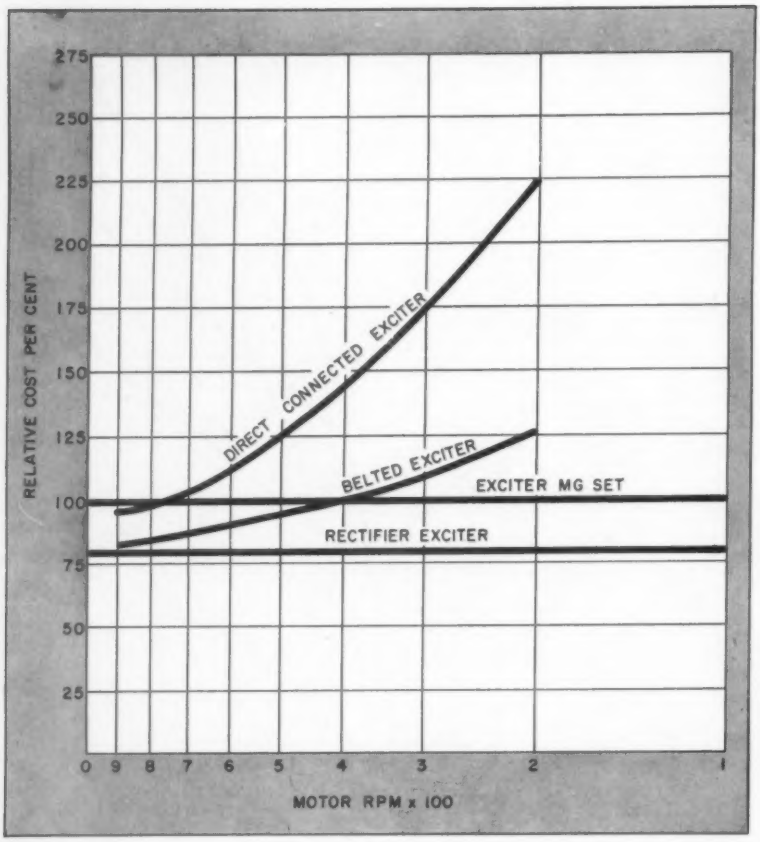


Fig. 4. Comparison of initial costs for different synchronous motor exciters

them, precaution must be taken in reducing excitation below nameplate rating.

When plant system power factor is at a satisfactory level, 80 per cent pf motors not subject to high momentary overloads are frequently operated at reduced excitation, since synchronous motors operated at or near unity power factor give the best efficiency.

Excitation systems differ, but all provide some method of adjusting motor power factor. Individual exciters, such as the direct-connected unit in Fig. 9, offer the simplest synchronous motor field control. Excitation to the motor field is then varied by a small plate-type rheostat in the exciter field.

When a common source of excitation for several synchronous motors is desirable, a large motor-generator set or rectifier can be used. With a common exciter source, a rheostat or adjustable resistor must be placed in the field circuit of each synchronous motor.

For large motors, above 500 hp with a ratio of horsepower to speed greater than one, the extra space required, and added rheostat I^2R losses may be objectionable. For example, a motor requiring 15 kw excitation at 125 v would require a motor field rheostat sized to carry 120 amp, as contrasted to only 5 amp if the rheostat were located in the field of a typical exciter motor-generator set.

Motor field rheostats for 15 kw capacity and larger are usually separately mounted because of size, and they are motor operated remotely from a control switch on the control panel.

For motor drives not requiring frequent power-factor adjustment, and consequent field current adjustments, a bank of resistors with taps can be used in place of rheostats. These cost only about half as much as the rheostats and usually can be mounted on the motor control.

Resistors provide no easy way for power-factor adjustment, since the resistor taps are selected to give rated field current or desired power factor at a given load—with no further adjustments anticipated.

Individual rectifiers can be used to supply excitation for synchronous motors. While not in wide use currently, this system may gain in popularity with the development of new, more compact metallic rectifiers of the semiconductor type, such as germanium and silicon.

When a rectifier is used, excitation adjustment can be accomplished in either of two ways: by changing taps on the rectifier supply transformer, or by adjusting a rheostat in the motor field.

For slow speed synchronous motors, machines below 514 rpm at 60 cycles, V-belt driven exciters and individual motor-generator sets constitute the most frequently used forms of excitation, since the direct-connected exciter is sizable and the initial cost increases rapidly as motor speeds decrease.

The exciter motor-generator set has proved to be the most popular source of excitation for low speed motors and for installatons where ambient conditions in the motor room make it desirable to locate the exciter elsewhere.

For many years, synchronous motors have been used almost exclusively for grinding mills, reciprocating air compressors, and similar low speed applications.

Efficiency and power-factor curves in Figs. 5 and 6 illustrate the power-factor advantages and superior efficiency of a typical low speed synchronous motor. Efficiency alone, for this rating, can save thousands of dollars annually in the power bill, as compared to an induction motor drive.

Other advantages of synchronous motors over induction motors in the low speed ratings are: 1. the initial cost is always less when the ratio of horsepower to speed is greater than one; 2. maintenance and erection are simplified by the generally smaller size, larger air gap, and availability of split rotor construction for mounting on the shaft of reciprocating pumps and compressors. See Fig. 1.

Where motors with rated speeds of 514 rpm and higher at 60 cycles are

Table I. Approximate initial cost of 80 per cent pf synchronous motors based on cost of induction units with capacitors to effect 80 per cent leading pf

	Per Cent of Induction Motor Cost				
Motor RPM	100 Hp	250 Hp	500 Hp	800 Hp	1000 Hp
1800	225	135	115	115	120
1200	165	115	100	100	100
900	160	115	100	100	95
720	170	115	95	95	95
600	170	115	95	95	95
514	160	110	95	95	95

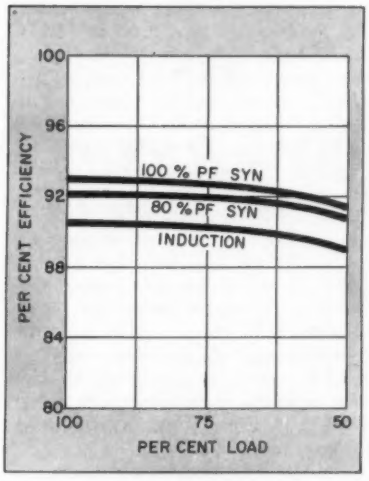


Fig. 5. Drive-motor efficiency curves

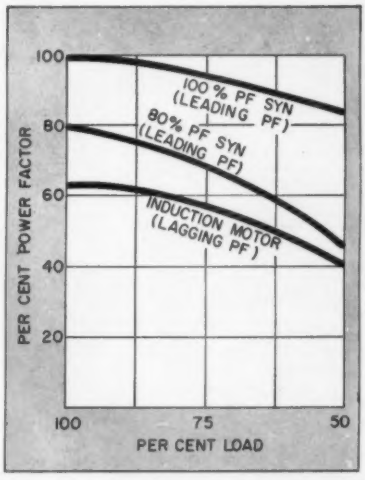


Fig. 6. Load effects on power factor

required, it may be advantageous to apply induction drive motors. If the required drive motor is to have a ratio of horsepower to speed of less than one, induction motors have the following advantages over synchronous motors: 1. initial cost is less; 2. omission of exciters and field application control simplifies operation and maintenance; and 3. induction motor efficiencies are comparable to those of 80 per cent pf synchronous motors.

Where plant power factor needs improvement and it is economically advantageous to apply induction motors, capacitors can be added at the induction motor terminals.

Capacitor size is usually limited to produce slightly less than 100 per cent power factor at the fully loaded motor. Larger capacitor ratings would cause overvoltages and excessive transient torques in the motor from self-excitation as the motor is taken off the line. This applies only when the capacitor is switched on and off with motor and located between motor and control.

On the other hand, locating the capacitor on the power supply side of the motor controller would leave it connected to the system continuously unless separate switching is provided.

Unity power-factor synchronous motors are more efficient at all loads than induction motors of equal rating.

Since induction motor efficiencies, including capacitor losses, are similar to 80 per cent pf synchronous motor efficiencies in the high speed intermediate horsepower class, initial cost and maintenance may become determining factors in motor selection.

Table 1 indicates the approximate initial cost comparison between induction motors with separately switched capacitors to produce 80 per cent pf lead, and 80 per cent pf synchronous motors in horsepower ratings from 100 to 1000 hp. These sizes are commonly used for plant drives, such as centrifugal pumps, motor-generator sets, compressors, and fans.

Note that motor starters and exciters are included, but installation expense and operating factors, such as maintenance and flexibility of power-factor adjustment, are not included in the comparison.

When adding equipment to correct power factor, the capacitor size required on induction motors, or the most desirable power-factor rating for a synchronous motor, can be determined by making a few sample calculations to determine the effect of the drive in question on plant power factor, and by a study of the power company's rate schedule.

Any electric power bill includes: 1. an energy charge, based on total measured kilowatt-hours consumed, and 2. a demand charge, based on maximum kw or kva used for a 15- or 30-min interval during the heaviest loading in the billing period. Power factor during the demand period will affect this demand charge, which is often determined by assuming a base power factor, for example 85 per cent, and adjusting the charge by the ratio:

$$\frac{.85 \times \text{measured kw demand}}{\text{actual power factor}}$$

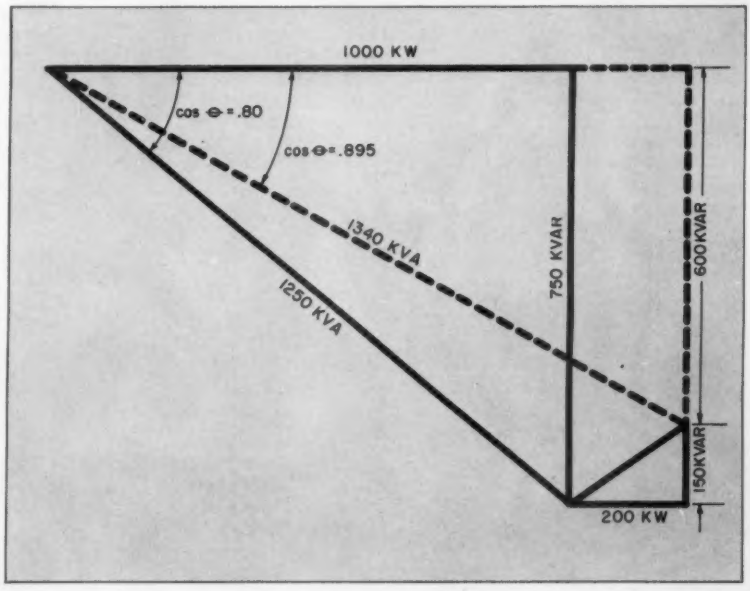
In other cases, the demand charge is based on straight kva demand and can be lowered with improved power factor. Regardless of the method used, it is necessary to calculate the kvar required to improve power factor, or reduce the kva figure to the most economical value. Raising power factor to 95 per cent will usually be economical. Beyond that point, reduced power cost during equipment life seldom equals the cost of kvar capacity required.

Calculating kvar requirement is easy if the right triangle relationship, Fig. 7 is sketched. For example, assume a plant load of 1000 kw, 1250 kva, 80 per cent pf lagging. Adding a 250 hp, 80 per cent leading pf synchronous motor, operating at full rating and 93 per cent efficiency, will provide 150 kvar. This results in a new total kva load of 1340 at 89.5 pf.

To increase the system power factor to 95 per cent will require an additional 195 kvar. This can be accomplished by adding capacitors or leading pf synchronous motor capacity.

However, in this example, raising system power factor from 95 to 100

Fig. 7. Vectors are useful tools for determining kvar required for pf changes



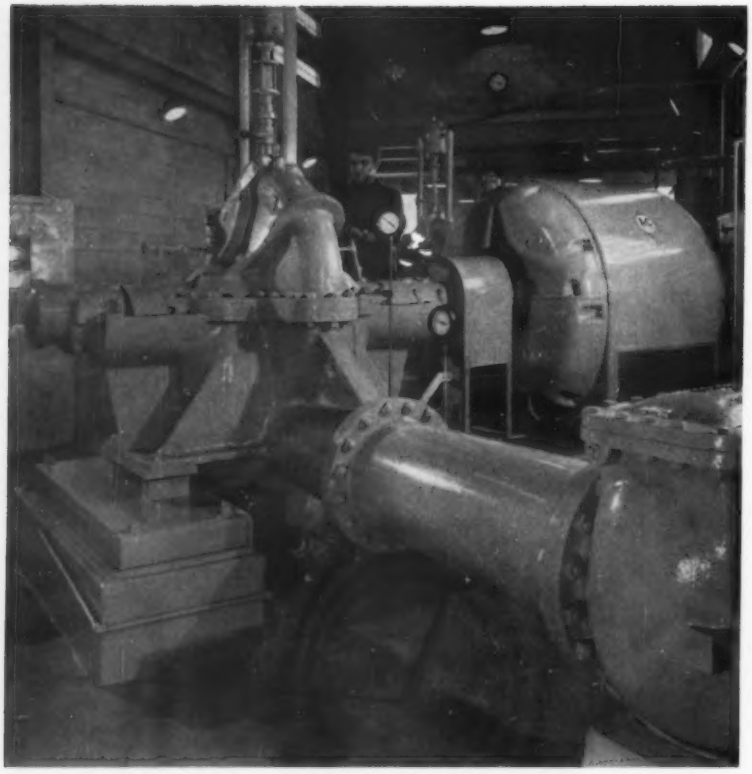
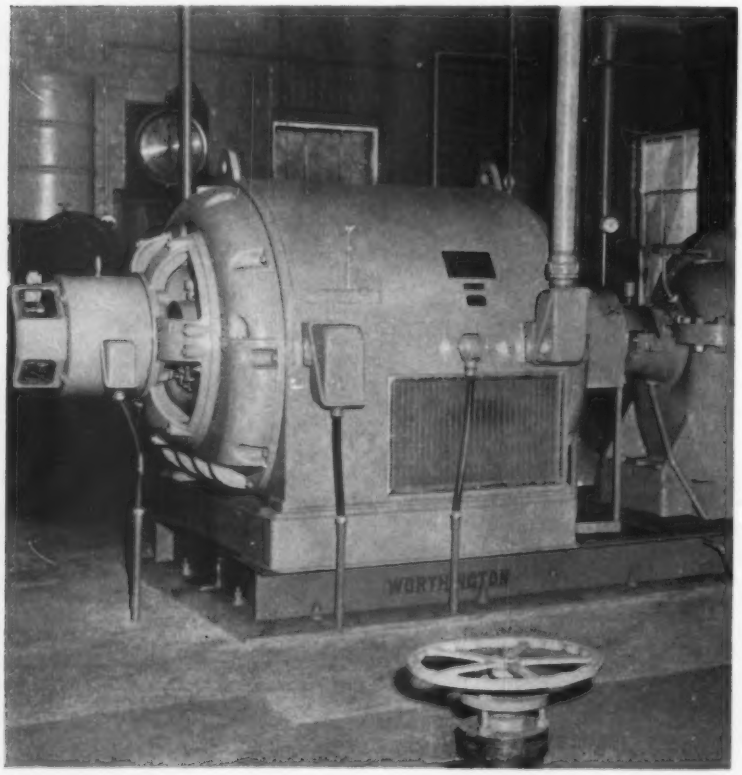


Fig. 8. Pumping unit has 600 hp, 700 rpm squirrel-cage induction motor drive

Fig. 9. In contrast, this drive unit is a 400 hp, 900 rpm synchronous motor



per cent would require an additional. 405 kvar, which is difficult to justify economically. The 250 hp motor could have been rated at 70 per cent, 60 per cent or greater leading power factor, but at increased cost. The increased motor cost would probably exceed the expenditure incurred by adding capacitors, since a synchronous motor rated 70 per cent pf is about 17 per cent more costly than one rated 80 per cent.

Calculations will determine whether a unity power-factor synchronous motor or an induction motor with static capacitors is more economical. Although capacitors add only a negligible kw load (they are about 99.7 per cent efficient), induction motors add to the kvar absorbed from the system by an amount equal to

$$\frac{\text{hp} \times .746 \times (\text{tangent of pf angle})}{\text{efficiency}}$$

which will require the addition of still more capacitors. Motor speed, equipment cost, rate schedules, and other factors will affect the economies of application.

Synchronous condensers are considered the most flexible means of power-factor control. They can provide continuous, close control of power factor. They can either supply or absorb kvar by being operated overexcited or underexcited, respectively.

When equipped with high response exciter systems, synchronous condensers also have the ability to maintain stable system voltage under heavy load swings by absorbing or supplying kvars to counteract the load swing. Voltage regulation is therefore their prime function.

Synchronous condensers are limited in their industrial and commercial applications. They are occasionally used where large concentrations of induction motors must operate temporarily under severe emergency conditions with low system voltage, caused by faults or switching operations.

A more frequent application today is in the metal industries, where arc furnaces contribute to the requirement for fast control of reactive power in order to avoid objectionable light flicker from the cyclic load swings.

The disadvantages of a synchronous condenser are largely economic. They are seldom considered for ratings less than 5000 kw and then the initial cost is approximately double that of capacitors. Installation cost is higher and the operation cost is greater, since losses are five to 10 times greater than capacitor losses.

Low speed drives 50 hp and larger always favor the synchronous motor. However, at higher speeds the comparison between induction and synchronous motors requires more consideration.

Frayed Braid?

This Clamp Keeps Hose Covering in Place

Fig. 1. Hose clamp, with lugs crimped, holds braid securely on small-diameter metal hose. Fitting can be attached

SUBSTANTIAL savings in time, labor and materials have stemmed from the use of hose clamps for braid retainers on metal hose—a new idea of the Metal Hose & Specialties Div. of the Houston Gasket & Packing Co., Houston, Texas.

Basis of the new method is an O-shaped, one-piece clamp that: 1. Eliminates the ring of solder formerly required prior to cutting; 2. Holds the braid in fixed position during cutting and welding; 3. Eliminates braid sleeves; 4. Is faster to install than a braid sleeve.

Furthermore, according to Houston Gasket personnel, compared to methods formerly used, the clamps save 30 per cent on labor costs, 20 per cent on flux and solder, 30 per cent on total cooling and heating time, 20 per cent on consumption of heating gases, and 50 per cent on the cost of braid sleeve or soldering rings.

This clamp, recently introduced by the Circle Clamp Corp., New York City, has two or three U-shaped lugs on its perimeter. It is merely slipped on the hose and crimped into place by squeezing the parallel sides of the lugs together with an ordinary pincers.

Cutting hoses to length was formerly done by heating a hose with a torch and applying a coat of silver solder about one inch wide, around the periphery of the hose, on both sides of the cut line. The solder was intended to keep the braid from fraying or unraveling.

The hose was then cut through the spot-soldered section with a hacksaw or carbide-tipped cutoff wheel.

Next step was to place a braid retainer or soldering ring on the end of the hose. Then, to complete the assembling operation, the proper fitting (to suit the end use of the hose) was silver soldered to the ring on the end of the hose.

New Cutting Procedure

Now, to cut a length of hose, two clamps are crimped about the area to be cut, just far enough apart to clear a hacksaw blade. The hose is cut cleanly and efficiently, with no need for preheating and silver soldering the section being cut.

In addition to retaining the braid during the cutoff, the clamps also serve as soldering rings at each cut end of the hose.

After the hose is cut to specified length, it is placed upright in a vise. Here, a thin coat of silver solder is applied to bond the clamp, braid and hose together. Following this operation, the fitting is placed on the prepared hose and a bead of solder is run around it. It is firmly joined to the hose and clamp by successive silver soldering, brazing and welding.

High working pressures are obtained by the initial permanent set of the clamp and the crimping action of the pincers on the lugs. In recent tests, on ⅞-in. wire braided hose, the Pittsburgh Testing Laboratory found that typical production clamps showed no slippage or loss of clamping action at hose burst pressures ranging from 12,300 to 12,800 psi. Clamps are available for use with metal hose in 20 sizes ranging from ¼-in. inside diameter to 2⅝-in. inside diameter.

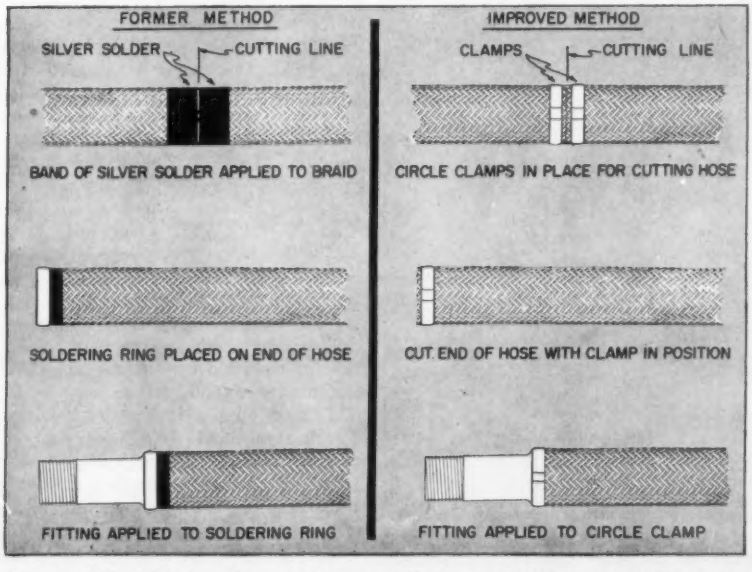

FORMER METHOD
SILVER SOLDER
CUTTING LINE
BAND OF SILVER SOLDER APPLIED TO BRAID
SOLDERING RING PLACED ON END OF HOSE
FITTING APPLIED TO SOLDERING RING
IMPROVED METHOD
CLAMPS
CUTTING LINE
CIRCLE CLAMPS IN PLACE FOR CUTTING HOSE
CUT END OF HOSE WITH CLAMP IN POSITION
FITTING APPLIED TO CIRCLE CLAMP

Fig. 2. Old (solder) and new (clamp) methods of retaining metal hose braid

Fig. 3. Clamped hose end, after cutoff

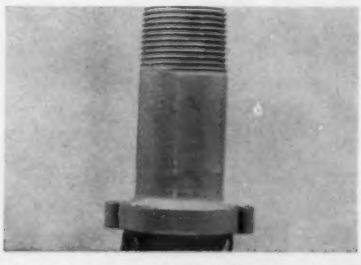


Fig. 4. Fitting soldered to ring clamp

Six Steps to Good Silver Brazing

Follow These Rules To Be Sure of Strong, Leak-Tight Joints

WHILE THE following precautions, suggested by Handy & Harman, manufacturers of silver filler metals and brazing fluxes, may appear to require extra effort, in the long run they will save you time and money. By producing strong, leak-tight, silver brazed joints of consistent quality, these steps make it possible to realize the inherent versatility and economy of low temperature brazing. Although compiled primarily for hand torch heating, most of the steps apply generally to all silver brazing, regardless of heating method.

STEP 1: Proper Clearance

The joint will be strongest when the clearance between parts (at brazing temperature in the case of dissimilar metals) is between 0.0015 and 0.004 in. Too little clearance limits the amount of alloy that can flow into the joint, thus producing a weak bond and sometimes causing voids. Too much clearance may cause uneven distribution of the alloy, as well as voids, by reducing the capillary attraction between the joint faces and the molten alloy. It also will waste alloy. Figure 1 illustrates the effect of clearance on joint strength.

STEP 2: Clean Metal

All surfaces to be joined must be clean and free of dirt, oxides, grease and oil. Although flux can dissolve a thin film of oil such as may be present on mill-supplied materials, it is not designed to do heavy clean-up. Oxides and dirt can be removed by emery cloth, steel wool, filing or grinding.

For large production quantities, blast cleaning or pickling in batches may be more economical than hand cleaning. Grease and oil should be removed with a suitable solvent or in degreasing equipment. Parts should be cleaned reasonably close to the time of brazing, and, once cleaned, they should be handled carefully to avoid contamination.

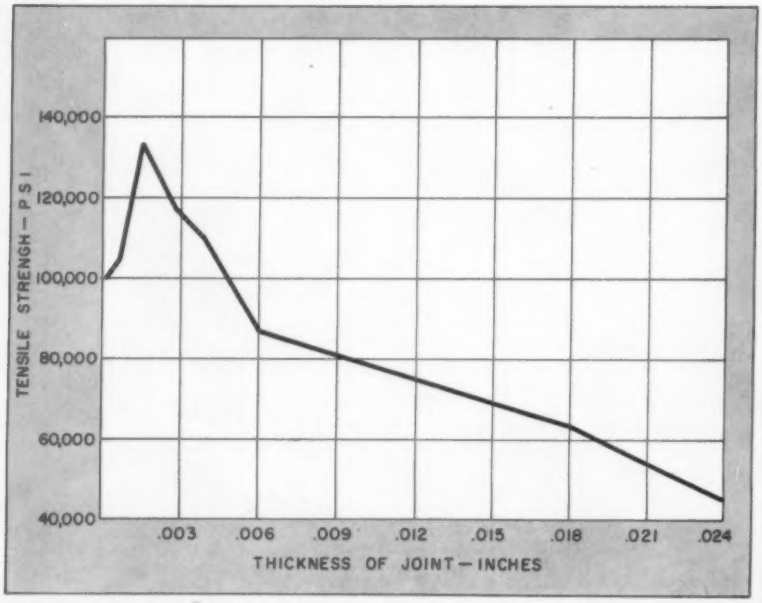


Fig. 1. Chart shows relationship between joint thickness (clearance) and joint strength. Actual strengths will vary somewhat for the type of metal being brazed, but the effect of clearance is relatively the same for all types of metal

STEP 3: Applying Flux

Except for a few specialized operations, such as the use of self-fluxing silver-phosphorus brazing alloys for joining copper parts, flux is essential. Flux does three jobs: protects the metal from oxidation during heating; dissolves any oxides that may form during the heating; and helps the brazing alloy flow quickly and wet the joint metals completely.

Apply enough flux to obscure the underlying metal, making certain to leave no gaps in the coating. The silver brazing alloy should be fluxed also. If the flux refuses to wet some areas of the metal, this is an indication that the surface has not been cleaned properly.

Flux will brush on more quickly, spread more uniformly and produce better fluxing action if it is kept warm (about 90-100 F) and covered. Several types of heated flux pots are commercially available. The flux should be applied just before the parts are brazed, so it will not dry out and flake off, leaving the metal without protection.

STEP 4: Assembling Parts

The assembly to be brazed should be brazed in a manner that will prevent the parts from shifting or becoming misaligned during the heating. If clamps are used for support, make certain that one end of the assembly is free to expand, otherwise it may distort or buckle during the heating. The fixture should touch the parts at as few points as practical and the points of contact should be out of the heat zone to avoid conducting heat away from the joint area.

Keep fixturing as simple as possible. Many assemblies, such as those con-

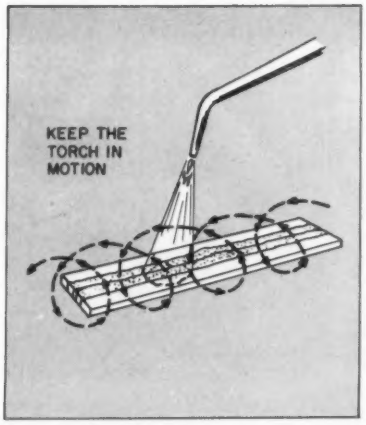


Fig. 2. A stationary torch will overheat the work. For even heating, keep the torch moving, and bring both parts up to brazing temperature at same time

taining tube and socket joints, are self-fixturing and need a minimum of support to stay in alignment. In many cases, a simple hold-down rod pressing down on the upper end of the assembly will hold the parts in place. It is desirable to have a slight pressure pushing the parts together, particularly when the brazing alloy is preplaced, so that any excess alloy and flux will be forced out of the joint when they become molten. This will help the parts seat more firmly and will help produce a stronger joint.

STEP 5: Heating the Alloy

To minimize forming oxides during the heating, the torch flame should be adjusted to a neutral or reducing flame, slightly deficient in oxygen. The tip of the flame should be somewhat bushy rather than sharp and needle-like. Do not heat the joint directly but let the heat soak into the joint by applying the flame to the area around the joint. Keep the torch moving to heat the area uniformly, Fig. 2; a stationary flame will exhaust the flux, cause excessive oxidation, and may distort thin gage parts.

If the parts being brazed are of unequal gage, the heavier section will need more heat in order to reach brazing temperature at the same time as the thinner member. When dissimilar metals are being brazed, the more conductive metal should receive more heat to make up for the greater amount of heat it conducts away from the joint area.

Parts should be heated to brazing temperature as rapidly as possible (with due caution to avoid overheating), so that exposure time to the flame, and hence the possibility of oxidation, are held to a minimum. If the silver brazing alloy is preplaced, do not attempt to melt it with the torch. Let the heat soaked up from the joint area do the job. If the alloy is hand fed, do not feed the alloy until the joint has reached brazing temperature.

The appearance of the flux offers a good guide to the temperature of the joint. As the flux is heated, it gradually loses its white opaque color. At about 1100 F, the flux appears to be a colorless, transparent somewhat glossy material, resembling cellophane. The silver alloy should be applied a second or two later. Temperature of the joint can be tested directly by melting the end of the brazing alloy with the torch to drop a small amount of the molten alloy on the joint. If the alloy draws up into a ball or forms a sluggish puddle, the metal has not yet reached brazing temperature and must be heated longer before applying the alloy.

When the parts are up to temperature, merely lay a section of alloy in the joint seam, and the alloy will melt and flow quickly into the joint like a thin liquid. If the brazing alloy does not distribute itself evenly, that part of the joint deficient in alloy probably is not quite hot enough. In this case, do not apply more alloy, but move the torch flame with a brushing motion toward the empty section of the joint. The alloy will follow the heat and complete the joint (if enough is present) even though you may be working against gravity.

Single-tip torches of multi-port design are popular for brazing relatively straight or moderately curved joints. However, for brazing small diameter tubing joints, ½ in. or less, double-tip torches are quite helpful in producing quick and uniform heating, since the joint can be heated from two sides simultaneously.

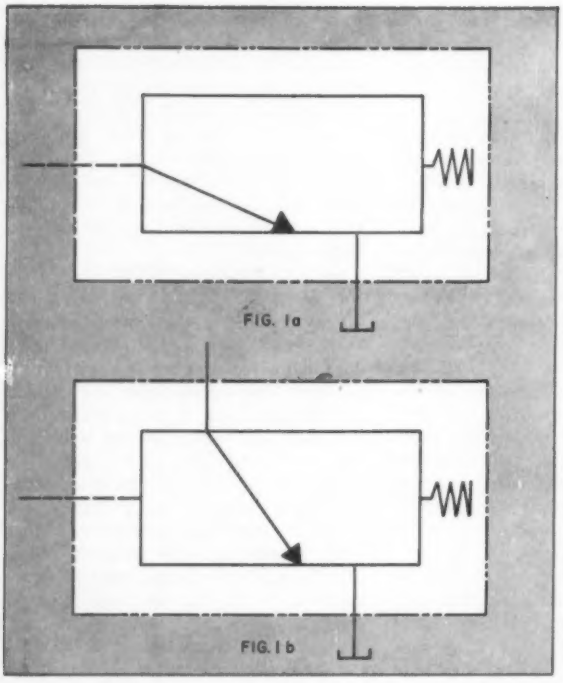
STEP 6: Final Cleaning

Flux can be removed most easily if it is done as soon as possible after the joint is brazed and while the joint is still hot. Wiping the joint with a wet rag or quenching it from black heat will flake off most of the adhering flux.

But, if the flux has become fairly cool, hot agitated water should be used. If the flux has cooled completely, brushing with a stiff brush may be necessary in addition to soaking.

Stubborn pockets of flux containing nearly insoluble oxides can be removed in a warm pickling bath of 10 per cent sulfuric acid. Nitric acid should not be used because it may attack the brazing alloy. In practically all instances, flux can be removed during normal pickling procedures preparatory to plating or other finishing operations.

Fig. 3. Quenching the parts from black heat speeds flux removal. Cooled flux can be removed more easily in a hot agitated batch, containing about 10 per cent sulfuric acid. Nitric acid should not be used as it may attack the brazing alloy



Figs. 1a, 1b. Direct acting relief and pilot operated valves

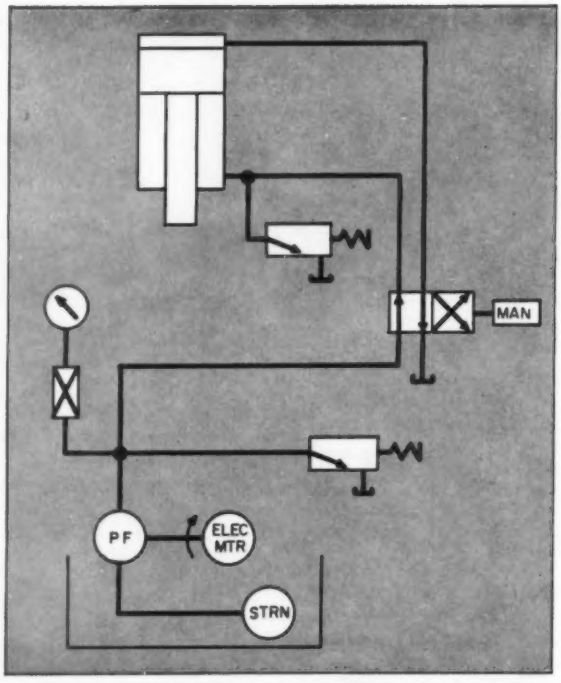


Fig. 2. L.p. relief valve holds oil temperature during standby

Fluid Power Maintenance

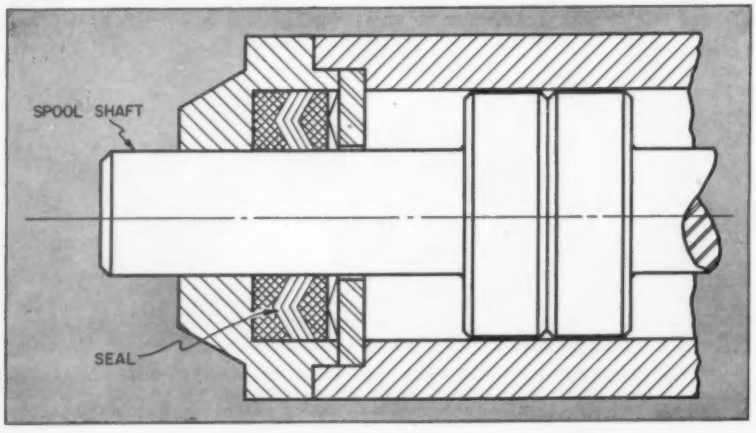
V. How To Maintain Hydraulic Valves

By H. L. STEWART and J. M. MORITZ, Logansport Machine Co., Inc.

PLANT ENGINEERING groups play a very important role in keeping a hydraulic system operating at full capacity. Their function to the hydraulic system corresponds to that of the doctor and his patient—while malfunctions or failures are infrequent they must be able to diagnose and correct them in the shortest possible time.

Proper maintenance of hydraulic valves is essential in the efficient operation of the system. Perhaps the best approach to the problem is to analyze the trouble and make suggestions as to how it should be corrected.

Fig. 3. Back pressure on seals will cause them to grip the shaft too tightly



Relief valves: The first valve in the circuit after leaving the pump is usually the relief valve which provides protection to the entire circuit from overload. This valve has a wide operating pressure range that is adjusted by an adjustment screw. Relief valves fall under two categories—the direct acting type and pilot operated type, see Fig. 1a and Fig. 1b.

The direct acting type employs a large spring which acts directly against the valve spool. The differential area of the valve spool raises the piston allowing the oil to spill through to the exhaust port when the pressure exceeds the spring setting. The spool movement is very rapid and the spool immediately closes the exhaust port when the pressure drops to the spring setting. In the pilot operated type the control spring is much smaller.

Relief valves are simple in design and rugged in construction. They are built in several different pressure ranges up to 5000 psi for industrial application.

Here are some of the symptoms of

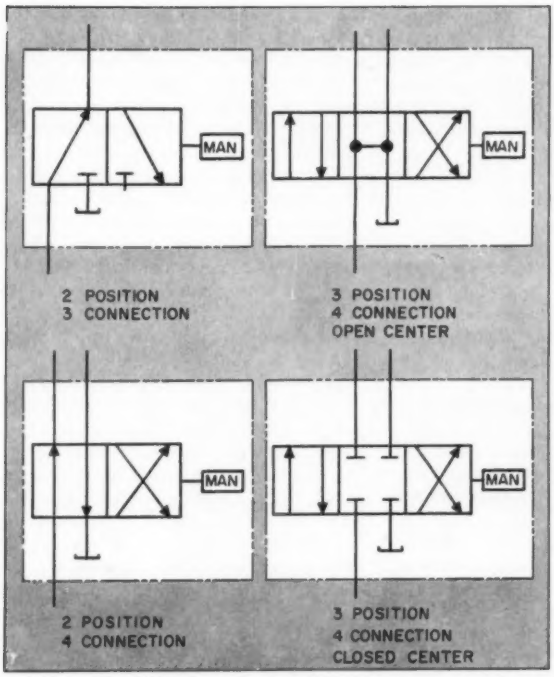


Fig. 4. Directional control valve may be three or four way

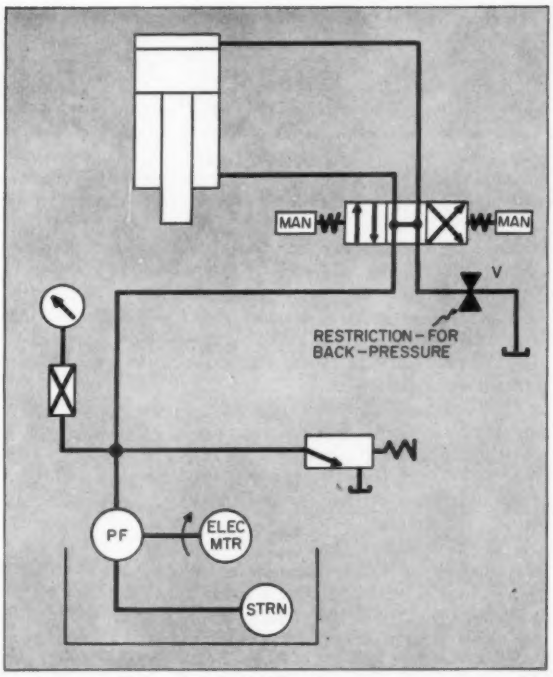


Fig. 5. Restriction will create back pressure, shift valve

malfunction of a relief valve and the steps for their correction. Don't try to service the relief valve, or any hydraulic valve, when it is under pressure.

1. Erratic fluctuation of the pressure gage. This denotes that something within the relief valve is not functioning properly. Here are the possibilities:

a. Broken relief valve spring. Due to the flexing of this spring especially those of the direct acting type of valve, fatigue failures occasionally result. As the spring breaks up and the valve stem comes in contact with the broken remnants of the spring, various pressure readings will be recorded on the pressure gage. By removing the valve cover the spring is readily accessible.

b. Dirt in the relief valve. As previously mentioned, dirt plays havoc in any hydraulic system. Here, dirt will cause the spool of either type valve to stick in the body or will foul up the small orifices of the pilot type. Lint is especially bad on the small orifices. It may be necessary to clean the system but in nearly all cases the relief valve should be completely dismantled and thoroughly cleaned. Varnish deposits will also cause the relief valve piston to stick. Clearance between the relief valve stem and the relief valve body is only a few ten thousands of an inch and any dirt or foreign matter can quickly cause trouble.

c. Excessive heat will cause a seizing action between the valve spool and the valve body. Keeping the oil temperature at a satisfactory level, not more than 140 F, will practically eliminate this condition.

d. Restriction in the exhaust line coming from the relief valve will not allow the valve to properly relieve and will cause erratic reading on the gage.

2. Drop or loss of operating pressure can be due to several causes.

a. Worn parts will cause a pressure drop. Wear between the valve body and valve stem will allow an excess of oil to flow from the pressure port to the exhaust port even though the land on the stem theoretically closes off the exhaust port. On new valves, if particles of dirt score the body enough, oil can leak from the pressure port to the exhaust port to cause a pressure drop. Worn seats and other pressure retaining parts will cause a similar condition.

b. A broken spring will usually cause a sudden pressure drop especially if it disintegrates. This can easily be detected by screwing down the adjustment screw. If the pressure doesn't rise it is likely that the spring is broken.

3. Excessive noise level. Noise in a relief valve can become objectionable to the operator of the system. There are known cases where operators have refused to operate certain machines until noise was eliminated. Causes of noise are:

a. Air moving through the relief valve from the pump or intake. To eliminate this each joint or seal from the intake strainer to the relief valve should be checked. The oil level should also be watched and the oil should be checked for aeration.

b. Broken or incorrect springs will also cause chatter or noise. When replacing a spring in a relief valve be certain that the correct spring is used. It's a good idea to keep a few relief valve springs in stock.

c. When a valve becomes excessively worn it will often set up an obnoxious noise. In this instance, the valve should be replaced.

4. Excessive oil temperature is often caused because of a restricted internal passage within the valve or a restriction in the line between the exhaust of the valve and the reservoir. Shifting in the internal valve core can be the cause of the former difficulty.

Heat is also caused by high pressure oil spilling through the relief valve for long periods. This is not the fault of the relief valve but a fault of the circuit design.

Low pressure relief valves are used successfully in certain parts of the system to keep the oil temperature at the correct level during long standby periods. An example of this is shown in the circuit in Fig. 2.

When reassembling a relief valve be absolutely certain that it is assembled correctly. Many service calls could be avoided if this were done. If there is any doubt, contact the manu-

facturer who will furnish cross section drawings or exploded views of his product.

Directional Control Valves: In advancing along the circuit the next valve is the directional control valve which directs the fluid to other operating valves or cylinders. This valve will be of the three or four way type, see Fig. 4.

Since these valves are manufactured in a large number of sizes and designs for different operations, they can be discussed only in a general way. The directional control valves mentioned in this article are of the spool type of construction only.

Here are some of the symptoms, causes, and suggestions on the malfunction of directional control valves.

1. Sticking of the valve spool. There are a number of conditions which may cause this situation.

a. Dirt. Here again dirt will play havoc with the functioning of these precision units. Extremely small particles of dirt will cause sticking of the valve spool especially in the spring centered, spring offset or direct solenoid style of valve. Dirt also may throw up a burr in the valve body which will cause the piston to stick. Core sand, another form of dirt, also has been known to cause valves to stick.

b. Back pressure. Back pressure on seals often cause the spool to stick, especially on direct solenoid operated valves or spring centered valves since the moving power is limited. Back pressure is caused by the exhaust oil acting against the seals. These seals tightly grip the shafts of the valve spool and make the valve inoperative. Figure 3 shows an example of this.

To overcome back pressure the exhaust lines must be of ample size and without restrictions. The valves should be mounted above the oil level of the power unit. Back pressure may also be caused by using the improper valve size in which the exhaust oil cannot flow freely from the valve. Core shifts in valve bodies which reduce the passage area also cause back pressure and this cause is often very hard to determine.

c. Excessive pressure. Pressures beyond those for which the valve is designed will often distort the valve body, especially if it is of cast construction with cores, and cause it to freeze the spool. In any hydraulic application do not use components for operating under pressures which are greater than their design limits.

d. Improper mounting of the valve may cause the spool to stick. Directional control valves should be mounted on a flat surface and the mounting screws should be securely tightened. However, do not put enough tension on the screw to distort the valve body.

2. External leakage. While external leakage of a valve could hardly be classified as a cause for malfunction, it is a condition which must be corrected. The reasons for this leakage may be the result of:

a. Foreign material imbedded or collected on the stem of the valve spool. While in all sliding spool type valves the stem of the valve must move through packing, any foreign matter or imperfections on the stem will cause leakage. Paint, weld spatter, or rust which often collects during erection period if the valves are not properly protected, will quickly ruin a set of stem seals. Pits or scratches on the stem will also ruin the packing.

b. Heat, both internal and external, not only over-cures the seals but reduces the viscosity of the oil to such a point that it will pass by a seal that under normal temperature conditions would form a perfectly tight seal. There are instances where normally flexible seals become brittle and charred. Valves should be shielded from hot spots. Internal heat can also be controlled as previously discussed unless the cause is due to trouble within the valve.

An open center, four way valve may cause a heating condition when the valve is supposedly exhausting all of its oil to the reservoir if the valve is not properly centering or if there is a core shift in the body which causes a restricted condition. In both cases a pressure gage in the inlet line to the valve will show up a restricted condition.

c. Leakage at the cover gaskets may be the result of loose cover screws or too much back pressure. Both conditions are easy to remedy.

Leakage at the mounting plate of a manifold mounted valve is usually caused by a defective seal, a defective seal seat, or loose mounting screws. First, check to see if the mounting screws are tight and if the condition still persists remove the valve and check the seal and the seat. External leakage may also be caused by porous castings.

3. Spool or solenoid valve failing to shift. While this failure may often be attributed to tight packing, dirt, excessive pressures etc., it may also be due to low voltage. A drop of 10 or 15 volts will often reduce the effectiveness of the solenoid to such a point that it will not have power enough to shift the valve spool. This is especially true on spring centered solenoid valves since the solenoid must not only overcome the friction of the packing and the friction between the body and spool but must also overcome the spring tension. Voltage is usually one of the last items that is checked when a solenoid valve fails to function. It should be checked first.

Faulty electrical connections at switches, push button stations, etc. will also cause the solenoids to malfunction.

Failure of spool to center in spring centered type valves may be attributed to a broken spring or to one which has taken a permanent set. Always use the spring which is designed for that particular valve.

4. Spool of four-way pilot valve failing to shift. With three-position, open center, four-way pilot-operated control valves, the spool may fail to shift as the pilot valve is actuated. This is caused because there is no pressure to the pilot connections even though the pilot valve is connected. The reason for this is that when the master valve spool is in neutral all the pressure is being returned to the sump so that when the pilot valve spool is shifted and the connections are made to either pilot chamber of the master valve there is no pressure to shift the spool. By inserting a restriction, as shown in Fig. 5, between the pump and the master valve there will be enough back pressure created to shift the spool of the master valve.

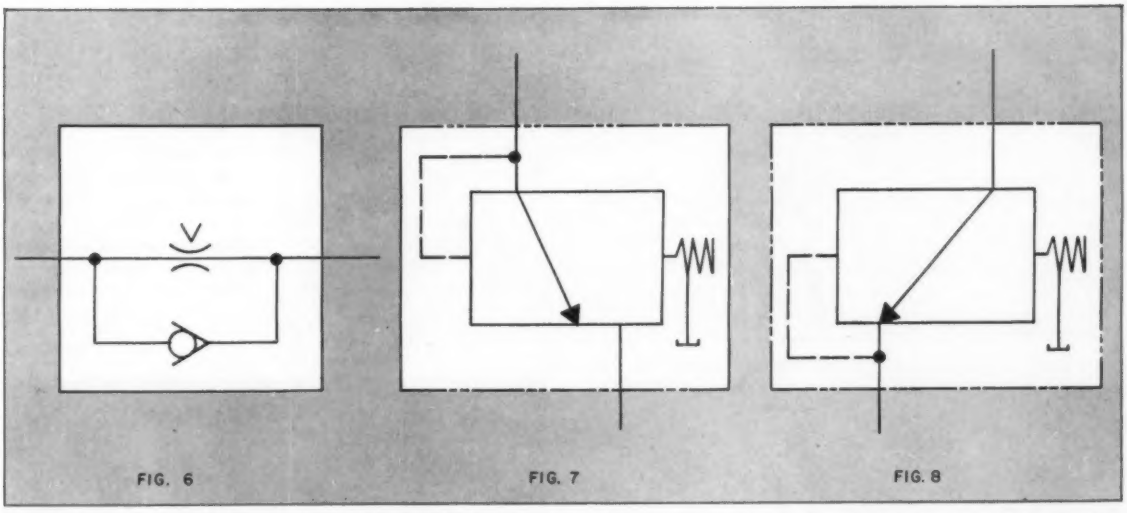
5. Cylinders failing to hold position or pressure. This condition may be traced back to the master control valve where internal leakage may be the factor. Internal leakage may be caused by dirt damaging the precision finishes, too much heat, wire drawing, or a worn condition of the spool or body. Complete repair may be necessary.

Flow Control Valves: If a flow control valve, Fig. 6, fails to function properly it may be due to conditions which cause other valves in the circuit to fail.

1. Erratic movement of the cylinder piston or shaft of the fluid motor may be caused by dirt or lint in suspension in the oil. As this foreign matter passes through the small orifice of the needle it will cause an erratic movement of the cylinder or motor. A broken spring may also be the cause.

2. Complete failure of the flow control valve is usually due to its being mounted backwards in the circuit. Although these valves are distinctly marked they are commonly placed incorrectly in the circuit.

3. Speedup in cylinder or motor motion may be caused by heat which reduces the viscosity of the oil. When the machine is put in operation at the beginning of the shift the oil may be cold. After operating a few hours the oil temperature may rise 70F to 80F which will reduce the viscosity of the



Figs. 6, 7 and 8. Diagrams show, left to right, flow control valve, sequence valve and pressure reducing valve

oil, thus speeding up the movement of the cylinder or motor. Temperature control can overcome such a condition.

4. Inability to depress the spool on cam operated type flow control valve. Here is a condition that is often due to oversight. If the external drain connection is left blocked, the bank of oil left by a slight internal leakage will block the spool so that it cannot be depressed. The valve may operate satisfactorily for a few cycles but the stroke of the spool will become increasingly shorter. Opening the drain connection and piping it back to the sump will eliminate this difficulty.

Sequence Valves: Sequence valves are designed to set up a sequence of operation where two or more cylinders are involved, see Fig. 7. Actually this valve is an adjustable spring loaded check valve. The spring adjustment on the spool controls the amount of pressure required to open the spool to allow oil to flow to the second cylinder of the sequence. Malfunctions in these valves are caused by dirt, heat, spring breakage, plugged drain connections, incorrect mounting or internal leakage.

Pressure Reducing Valves: These valves, shown in Fig. 8, are used to reduce the operating pressure in that part of the circuit where less pressure is required. They are designed to give as much as a 10:1 pressure reduction. While malfunctions of these valves may be contributed to many of the same factors which cause relief valves, flow control valves and sequence valves to malfunction, a major cause is the improper setting of adjustments. These adjustments sometimes become "touchy." Often high noise level and erratic action result from improper adjustments.

There are other functional valves such as unloading valves, counterbalance valves, etc. used in hydraulic circuits. Malfunction of these valves can usually be traced to causes already mentioned.

Repair of Control Valves: In repairing control valves there are a few simple suggestions which, if allowed, can make the repair job much easier and more satisfactory. A valve which has been in service for a long period and has been properly repaired will perform as well as a new valve.

1. Make the repairs in a clean area. A littered repair bench is not conducive to good work. Wash all parts thoroughly in a good cleaning solution. It may be necessary to brush some surfaces in order to loosen the deposits. After all parts are clean they should be dried. Lay each piece on a clean cloth or paper and make certain that none of the parts is lost.

2. Check all seals and packings. If the valve has been in service for any length of time the seals and packings should be replaced.

3. Inspect the fit between the valve body and the stem, also check the finish on the valve bore and the stem. If either shows any scored places these imperfections should be immediately corrected. The bore of the body should be cleaned by boring or honing, then the stem should be replaced with an oversize stem. In some cases a good plating job will bring the old stem up to the size of the body bore. The fit between the body and the stem should be between 0.0002 in. and 0.0007 in. It is suggested that where several valves of the same type and size are used in a plant a small supply of oversized stems be carried in the maintenance department in order to facilitate repairs. A supply of packings and seals should also be available. If the valve bodies contain any seats they should be cleaned and refinished.

4. If it is necessary to do any machining or fitting, the parts involved should again be cleaned before reassembling.

5. Make certain that no lint is allowed to collect in the valve body.

6. When assembling a valve make certain that all parts are assembled correctly. Do not put undue tension on cover screws but be sure that they are tight enough to eliminate gasket leaks.

7. When assembling directional control valves which have mounting feet in the covers place the valve on a surface plate before tightening the cover screws in order to ascertain that the mounting feet are flat.

After a valve has been assembled it should be tested before it is placed back into the system. Each valve should be subjected to low pressure then the pressure should be brought up gradually to the full operating range. The valve should be operated several times checking for leaks both externally and internally. Also check its functional operation.

If a repaired valve is put back into stock for future use it should be amply protected from dirt, heat, and dampness. Protruding valve stems should be given a protective coating and port openings should be plugged with either a pipe plug or a shipping plug. Wrapping valves in oiled paper is helpful.

Valves are a precision equipment and should be handled accordingly. A little extra care in servicing, maintaining and installing them will pay dividends. Always keep solenoid covers, adjustment needle covers and lock wires in place to prevent tampering with valve adjustments.

Plastic Model "Visualizes" Stresses Expected in Steel Reactor Vessel

USING A MODEL made of a special plastic, scientists at the Westinghouse Research Laboratories have found a way to see and study the stresses existing inside the solid steel pressure vessel of a power-producing nuclear reactor.

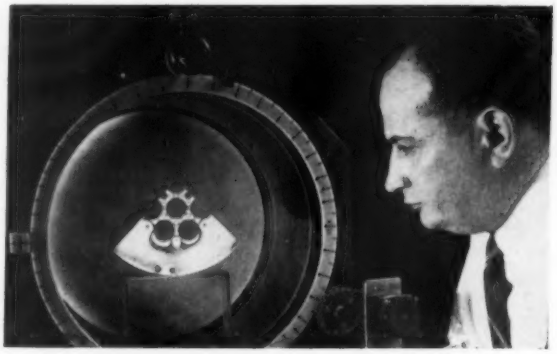
The pressure vessels now being studied are those for power reactors of the pressurized water type. In a reactor of this kind, water is pumped through the pressure vessel, where it acts as moderator for the uranium fission process and also removes vast quantities of heat.

Being part of a sealed system under pressures as high as 2000 psi, the pressure vessel must withstand these pressures. However, for design purposes, it is extremely difficult to calculate the various stresses which the high-pressure water creates in the walls and head of the vessel.

Examination of the shell of a nuclear reactor uses a laboratory procedure called photoelastic stress analysis—a research technique which the Westinghouse laboratories have long pioneered. An exact model of the structure to be studied is constructed from a photoelastic resin, or plastic. These resins have the ability to show visibly, under polarized light, the twisting, bending or other stresses they undergo when forces are applied to them.

The plastic pressure vessel model is about two feet high, a foot and one half in diameter, and weighs about 100 pounds. After the model is cast, and machined to shape, it is filled with air to a pressure of approximately 4 psi. This pressure produces in the model the exact stress patterns existing in the actual vessel under its working pressure of about one ton per square inch.

The model is then cured by heating, which "freezes" the stress patterns permanently into the walls. Samples cut from the model can be examined under polarized light, and the stress patterns can be studied rapidly and with great precision.



Control House Features Diagram of Cracking Unit on Wall for Quick Observation

ANOTHER MAJOR UNIT has been completed at the new Delaware Flying A Refinery, located about 15 miles south of Wilmington, Del. A fluid catalytic cracking unit—the world's largest such unit.

In the central control room, a huge wall panel graphically diagrams the maze of columns, vessels, piping and equipment in the cracking unit. From the control console, the operator can keep close check on the situation.

Lights indicate valve positions in the flow lines, and for close control of the cracking process at this new Tidewater Oil Company refinery, during the production of top-grade motor and aviation gasolines.

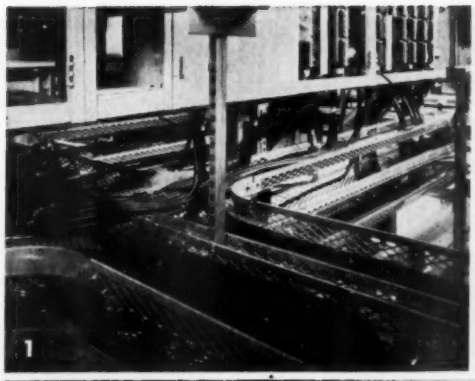
Insulation "Poured" Around Pipe in Underground Installation

NEARLY ALL of 38,774 ft of underground pipe in one of the world's largest non-military high temperature hot water heating systems is being protected with 1515 tons of Gilsulate insulation. The heating system is an integral part of the $90 million expansion program at New York's International Airport, and runs from a central heating plant through sandy soil under roads, runways and walks to all of the proposed buildings planned for the 655-acre site.

The piping system is 7.34 miles long, and includes 53 expansion loops (which alone total more than a mile of pipe). In the finished system, water will be piped at 380F and return to the central plant at 240F.

Unusual design problems had to be overcome in the installation, because of the terrain. Before any pipe was laid, concrete slab pads were placed along the entire length of each trench. A wall of concrete slabs or blocks was next erected, in which the system's pipes were confined. The Gilsulate insulation was poured around the pipes in the trench, and the area de-watered until the insulation was cured. This insulation, manufactured by the American

Gilsonite Co., is a granular material made from unique solid hydrocarbons found only in eastern Utah. When the steam is turned on to flow through pipes which are covered with the granules, the material fuses to the pipe, forming successive plastic-to-sintered-to-granular zones of protection against all forms of underground corrosion. It is also an excellent heat-insulating medium.



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2 Easy To Pull, Rome Power distribution cable slips quickly into manholes and through conduit or duct runs.

3 Ideal For Underground applications, this Rome cable resists the corrosive effects of burial.

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Rome's power distribution cable helps you cut costs three ways

When you install RoMarine-RoPrene cable instead of a cable with metallic covering, you can save money three ways:

- **Lower original purchase or replacement cost**
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Extremely versatile and tough, RoMarine-RoPrene cable can be buried directly in earth, installed in ducts or conduits, or hung overhead on poles. No longer must you stock three different kinds of 600-volt cable. And easier termination and splicing will provide further economies—every 30-minute saving is worth more than $2.00 to you!

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Besides economy, you get real dependability from this versatile and rugged Rome cable. The tough Neoprene jacket assures an exceptionally long service life. It's light in weight; it's virtually immune to the effects of electrolysis, corrosion, and temperature extremes; and it's highly resistant to oils, acids, alkalies, moisture, abrasion, flame and weather.

All in all, this is an ideal 600-volt cable for electric utilities, industrial plants, rural electrification, and airport wiring. And it can often be used as a building wire that will save you money in the long run.

Approved and service proved

RoMarine-RoPrene is specifically approved by Underwriters' Laboratories as Type USE for underground service entrances. And it's approved by the CAA for airport wiring when CAA Specification L-824—with Type A insulation—applies.

Proved superior for general purpose wiring, this cable can be unhesitatingly recommended for 75°C. operation, except in the case of special circumstances specifically described in the National Electrical Code.

To get real economy *and* dependability, specify Rome's power distribution cable—RoMarine-RoPrene—for your next job. Contact your nearest Rome Cable representative for more information—or write to Department 602-B and ask for Bulletin RR-2. Rome Cable Corporation, Rome, New York.

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NEW PLANT CONSTRUCTION — advance information on location, costs

Okay, Ark.—Ideal Cement Co., Denver, Col., is proceeding with a $2-million expansion program at local plant here, which will increase plant's capacity by approximately two million barrels annually. Work will be completed late in 1957 or early 1958. Company currently has expansion work in progress at other facilities located in Vancouver, B.C., Baton Rouge, La., and Houston, Tex.

Searcy, Ark.—Clary Corp., Junipero & Thomas Streets, San Gabriel, Calif., manufacturer of business machines, electronic equipment and missile and aircraft components, plans to construct a new manufacturing plant on site recently acquired. Preliminary engineering work has been done and ground has been broken for new facility scheduled for operation by mid-1957.

Monrovia, Calif.—Consolidated Engineering Corp., Foothill Blvd., Pasadena, Calif., plans to construct a two-story plant for the production of static and dynamic recording and measuring systems. New facility will have a floor area of 130,000 sq ft, and construction is scheduled to get under way by early spring of 1957 for completion in 1958. A second unit with the same floor area is planned at a later date, possibly late in 1957 or early 1958 and will be geared for straight production work. Construction of both units will represent an investment approximating $2.5 million.

Montebello, Calif.—Link-Belt Co., 307 N. Michigan Ave., Chicago 1, Ill., will construct a new manufacturing plant for the production of materials handling equipment. New facility will have a floor area of 90,000 sq ft. Construction of new plant will begin in early 1957 for completion by the end of that year. Cost of new facility is expected to exceed $1 million.

San Leandro, Calif.—Poultry Producers of Central California, 840 Battery St., San Francisco, Calif., has authorized plans for construction of new processing and packing plant, including refrigeration and egg-candling facilities. Construction work will get under way soon and the new plant, which will cost an estimated $2.5 million, is scheduled to be in operation late in 1957. Swinnerton and Walberg, San Francisco, Calif., are the construction engineers.

Lakeland, Fla.—Kraft Foods Corp., a division of National Dairy Products Corp., 500 N. Peshtigo Court, Chicago, Ill., will construct a citrus processing plant. Plant will produce citrus concentrate, fruit salad and cattle feed as citrus by-product. The new facility will cost about $5 million.

Nicholas, Fla. — Kaiser Aluminum & Chemical Corp., 1924 Broadway, Oakland, Calif., plans to construct a new pilot acid neutralizing plant on a 40-acre site near here. Plant, to be completed in the summer of 1957, will neutralize acid waste from the phosphate industry, producing a salt for use in company's chemical operations. Wellman Construction and Engineering Co., Lakeland, Fla., are construction engineers of the project, reported to cost approximately $500,000.

Albany, Ga. — Gravely Tractor Co., Dunbar, West Virginia, will construct a new manufacturing facility on a five-acre tract recently acquired. Plant will have a manufacturing area of 30,000 sq ft. Plant and equipment reported to cost $750,000.

Rome, Ga.—Mead Corp., subsidiary of the Brunswick Pulp & Paper Co., Brunswick, Ga., has announced a major expansion of company's plant facilities for the production of kraft paper and paperboard products. Plans call for an expenditure of better than $20-million over a two year period for plant and equipment facilities.

Savannah, Ga. — American Cyanamid Co., Industrial Chemicals Division, 30 Rockefeller Plaza, New York 20, N. Y., plans to expand its facilities for titanium dioxide pigment production in plant completed last July. New expanded facilities will be in operation by early 1958.

Alton, Ill.—American Smelting & Refining Co., Federated Metals Division, 19 Nassau St., New York, N. Y., plans to erect a secondary aluminum smelter. New plant will have a total capacity of 72 million lb a year and will double present output. Work on the new plant is scheduled to begin early in 1957, and will represent a multi-million dollar investment.

Chicago, Ill.—Standard Oil Co. (Indiana), 910 S. Michigan Avenue, plans to construct a new chemical processing plant to be located in the mid-west. Exact site for the plant which will cost in excess of $10 million has not been selected as yet. Construction of the plant will start early in 1957, for scheduled operation by mid-1958.

Granite City, Ill.—Granite City Steel Co., Hamilton & Randolph Sts., will expand its facilities to increase ingot capacity. Included in this round of expansion is a new blast furnace, a sintering plant, and two new batteries of soaking pits in which ingots are heated before rolling. Improvements to the open hearth furnace facilities are planned and a new continuous galvanizing line will be installed. Cost to exceed $8.5 million.

Monsanto, Ill. — Monsanto Chemical Co., 1700 S. Second St., St. Louis 4, Mo., has announced plans for additional production facilities for the production of phenol at company's plant here. Work will get under way soon and plant is expected to be completed by mid-1958. New production facilities

(Continued on page 194)

Construction on The Firestone Tire & Rubber Co. butadiene plant at Orange, Texas, is scheduled for completion in early 1957. Picture shows the first of two 87-ton reactors being installed in utility building. Materials from Texas oil fields will be used in manufacture of butadiene, a component part of synthetic rubber

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National Cranberry Association replaced costly six-step manual handling of frozen cranberries with a one-step Airstream System. Labor costs are down 90%.

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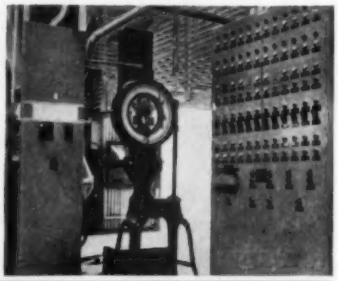
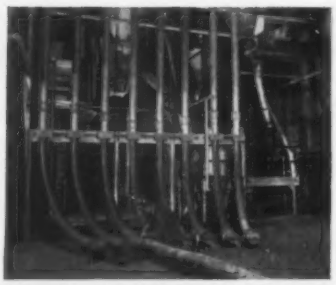
One man at this panel controls a complex 3000-foot Airstream Conveyor at a large synthetic fiber plant. Since previous method required 30 men, labor costs have been cut 96%!



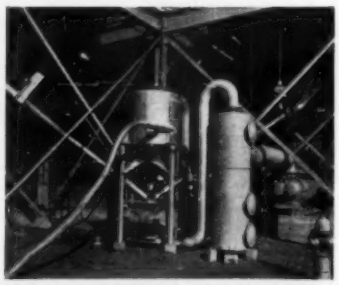
3. HANDLE SEVERAL MATERIALS WITH ONE CONVEYOR

Giant automotive foundry unloads boxcars of eight different materials with one Airstream System. Self-cleaning conveying lines permit quick change-over without intermixing one material with another.



4. AVOID CONTAMINATION

Tennessee Eastman Company unloads hopper cars of Tenite polyethylene with an Airstream Conveyor. Absolute product purity is protected by (1) enclosed stainless steel system, and (2) filtered conveying air.



5. PREVENT MATERIAL BREAKAGE

A friable filter aid is conveyed by Airstream Conveyor for Eli Lilly & Company at 7½ tons per hour. Specially engineered system cushions moving material and prevents damage to particles.

6. MINIMIZE INSTALLATION COSTS

By installing an Airstream System to convey pulverized coal, Standard Forgings Corp. cut first cost 60% below a comparable mechanical conveyor. System goes under railroad tracks and around building; savings are $35,000 per year.

If you are looking for a conveyor with one —or all—of these advantages, investigate Dracco Airstream Conveyors. Dracco has extensive experience in designing and manufacturing modern automatic handling systems to meet these and other requirements. For more details, write for Bulletin 529.

DRACCO CORPORATION
4035 East 116th Street • Cleveland 5, Ohio

DRACCO *airstream* conveyors
dust control equipment

For more facts circle 569 on Reply Card

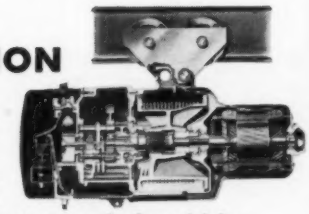
For more facts circle 570 on Reply Card——→

ACCO products

The WRIGHT Hoists for Dependability

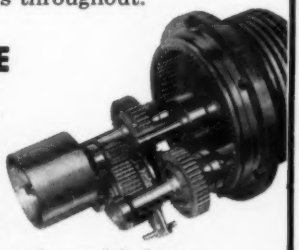
These features make WRIGHT Speedway Hoists your best buy for—

MORE PRODUCTION



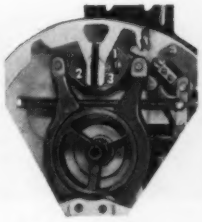
Fine balance and heavy duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30-minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core supplies shock resistance to most severe service stresses. Anti-friction bearings throughout.

LONGER LIFE



Strength of gear teeth of WRIGHT Frame 2 and 3 Speedway hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flanged cross section is bolted to drum at six points and provides extreme resistance to distortion.

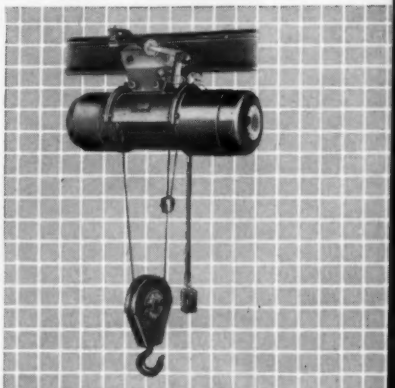
EASY MAINTENANCE



There is nothing to adjust but the cam to keep brake in perfect adjustment. When excessive load drift occurs... remove the screw shown at Position 1, swing the cam until Position 2 is in line. Replace the screw. Position 3 is provided for the final third of brake lining wear. Brake springs and solenoid never need adjustment.

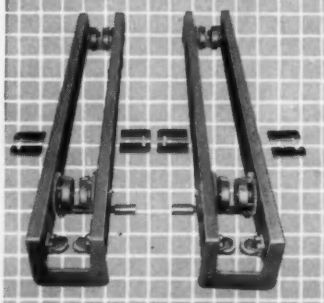
Better performance at lower cost by using WRIGHT units for local-built cranes

SPEEDWAY ELECTRIC HOIST



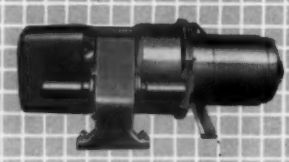
Available in Frame 1, 1½, 2 and 3 sizes with capacities from ¼ ton to 10 tons.

END TRUCKS FOR ALL TYPES

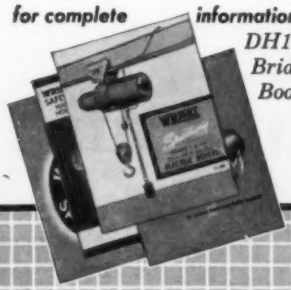


For motor-driven cranes and hand traveling cranes—both top running and under-hung types. Timken bearings throughout. Wide range of capacities.

CRANE DRIVE UNIT



Designed for crane and double-beam trolley propulsion. WRIGHT Crane Drive Unit consists of an electric motor with a fluid coupling transmitting power to a well proportioned gear reduction. Size 1—with motors to 2 HP. Size 2—with 3 to 7½ HP motors.



for complete information on **WRIGHT** *Hoists and Crane components ask for:* **Speedway Hoists:** *(Frame 1) Booklet DH133B, (Frame 2 & 3) Catalog E55A.* **Motor Driven Cranes:** *Underhung, Single Bridge, Bulletin #227; Top Running, Bulletins #DH448 or DH449* • **Crane Drive Units:** *Booklet DH-431A* • **Hand Traveling Cranes:** *Bulletins #DH-468 and #DH-348B*

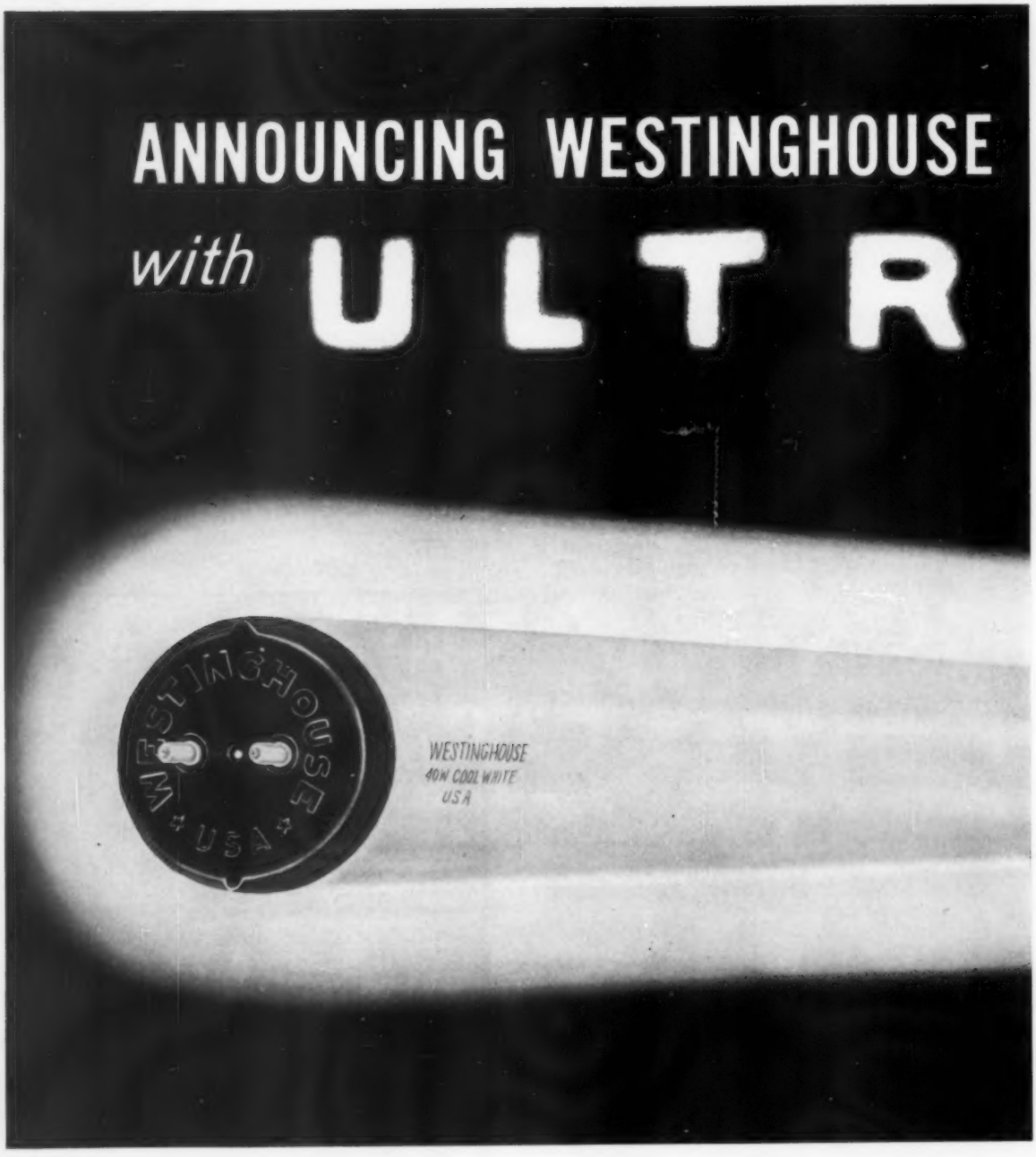
ACCO

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

Better Value

ANNOUNCING WESTINGHOUSE *with* ULTR

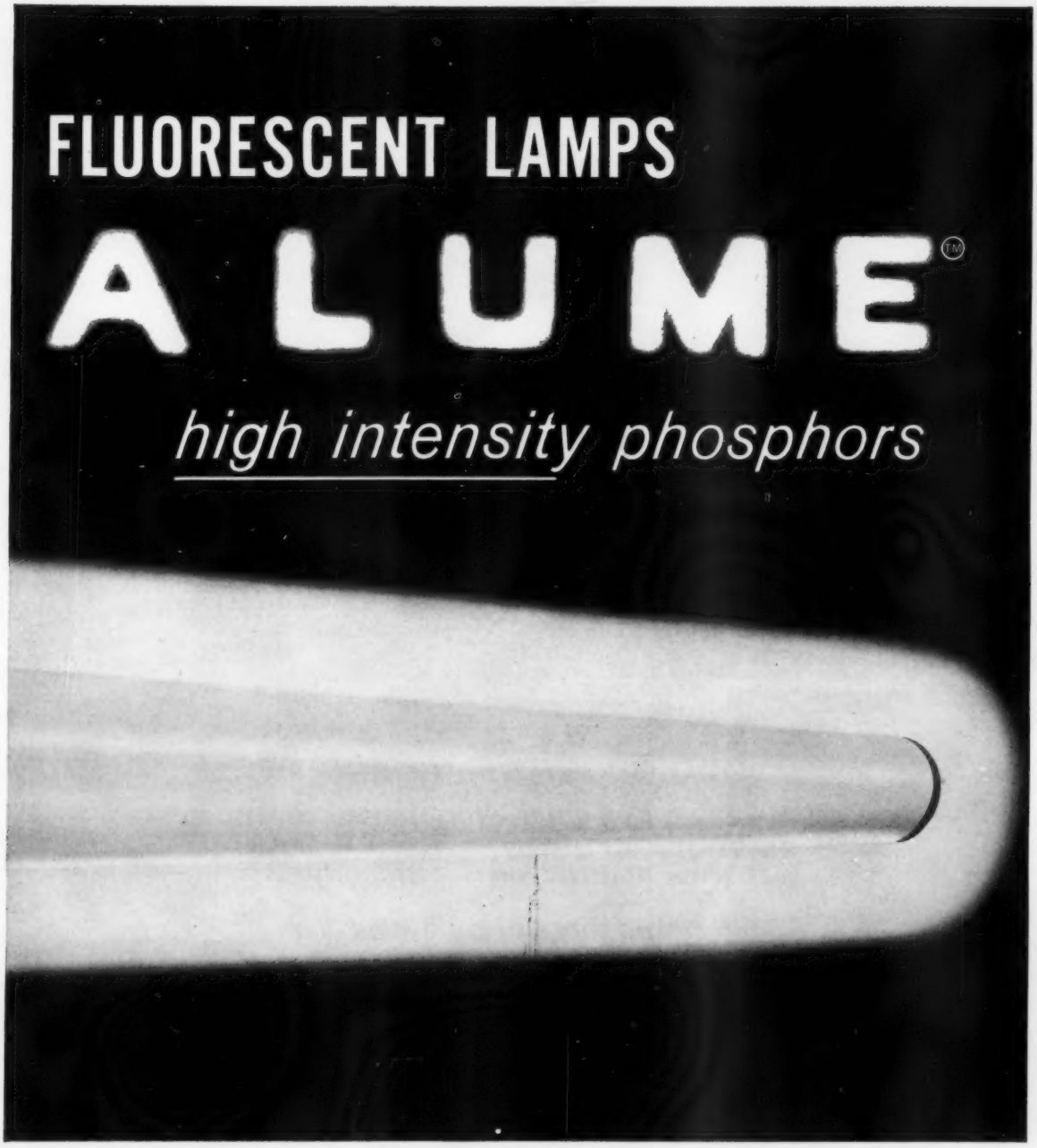


YOU CAN BE SURE... IF IT'S Westinghouse

FLUORESCENT LAMPS

ALUME®

high intensity phosphors

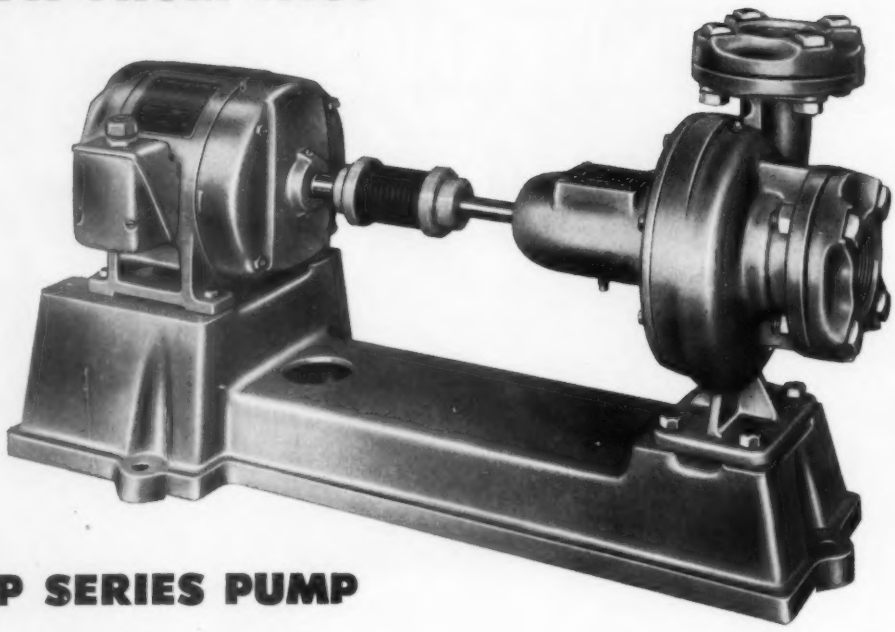


START BRIGHTER... MAINTAIN BRIGHTNESS LONGER...

- **MORE LUMENS PER WATT**—more light for your dollar.
- **PLUS UNIFORM END-TO-END LIGHT** . . . always perfectly color-matched . . . maximum light output maintained throughout life—and carrying the **WESTINGHOUSE ASSURANCE** of performance satisfaction or full purchase price refund.
- Get the most for your lighting dollar—call your Westinghouse Lamp Distributor today, or write Westinghouse Lamp Division, Dept. PE, Bloomfield, N. J.

For more facts circle 571 on Reply Card

NEW FROM TACO



MP SERIES PUMP

For quiet, vibrationless operation and rugged dependability on large installations

Designed specifically for heating and cooling systems requiring quiet, smooth operation, the new Taco MP series pump offers a host of outstanding features:

- Water-tight, self-adjusting, self-lubricated mechanical seals.
- A motor selected for quiet operation, equipped with oil lubricated, bronze sleeve bearings.
- A spring drive coupling which easily absorbs starting torque and designed for quiet operation.
- A long-life impeller shaft of stainless steel, hardened and ground to a mirror finish.
- Bronze bearings in bracket, separated by a thrust collar attached to the shaft, absorb all end thrust.
- An oil bath circulating system with modern slinger rings, lifts oil to both bronze bearings.

Bearing bracket, impeller and shaft are completely removable without disturbing motor, volute or piping connections.

- A closed type impeller of bronze or cast iron, dynamically balanced for smooth noiseless operation and designed to eliminate hydraulic thrust.
- Volute on body legs bolted directly to the base prevent piping strains from changing pump alignment.
- A base of cast iron designed with a three-point floor mounting to simplify leveling. Provision is also made to fill with concrete for sound deadening.

For the features that mean a better performance for every large hot water heating or cooling system, put the new Taco MP series pump on the job!

Better Heating

Taco

Better With TACO

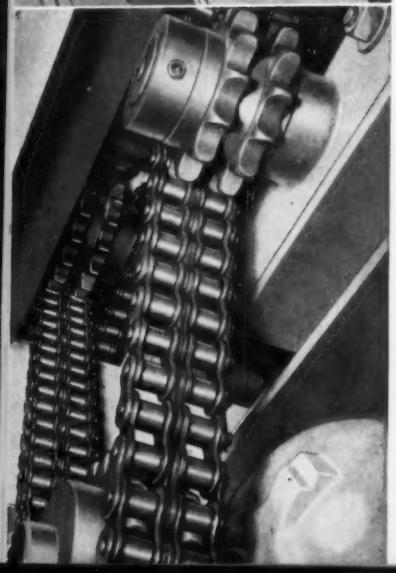
TACO HEATERS, INCORPORATED

1160 Cranston Street, Cranston 9, R. I.

342 Madison Ave., N. Y. 17, N. Y.

4 Gilead Place, Toronto 2, Can.

For more facts circle 572 on Reply Card



10,000 Foot Automated Conveyor System Uses 20,000 Live Rollers— Each Driven by Diamond Roller Chain

Here dependable, non-slip, long-life Diamond Roller Chain drives are of prime importance—*there are no other outlets for the production lines.*

Five production buildings can feed 1800 products per hour into the overhead conveyor system. The conveyor sorts products into trains, approximately 24′ long, moves them 3,000 feet across the park to a central warehouse and divides into 6 product groups for selected storage or shipping.

This is one more example of Diamond Roller Chain performance, extra economy, long operating life and *dependability* on the job.

Diamond Engineers are available to help you solve *your* drive problems. Call now. There is no obligation.

DIAMOND CHAIN COMPANY, Inc.

Where High Quality is Traditional

Dept. 614, 402 Kentucky Ave., Indianapolis 7, Indiana

Offices and Distributors in All Principal Cities

Please refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

DIAMOND ROLLER CHAINS

For more facts circle 573 on Reply Card

Put plant traffic on a safe road

with strong, easy-to-erect Armco Guardrail

Armco FLEX-BEAM Guardrail installed in a parking lot at Bendix Products Division, Mishawaka Plant, Mishawaka, Indiana. Note stall markings on the rail. No danger of wearing off and they are easy to see, even with snow on the ground.

Protects Machines and Equipment; Guides Traffic, Promotes Safety

You can use highway-tested Armco FLEX-BEAM® Guardrail to add safety and convenience to plant traffic. The cost is low.

FLEX-BEAM is a beam-type, deep corrugated steel rail (10 or 12 gage) that resists severe impact, yet flexes slightly to cushion the shock of a collision. You can attach it easily to almost any kind of post. Eight bolts join 12-foot sections. Maintenance is no problem. An occasional painting keeps FLEX-BEAM highly visible. The corrugated surface reflects light from any direction.

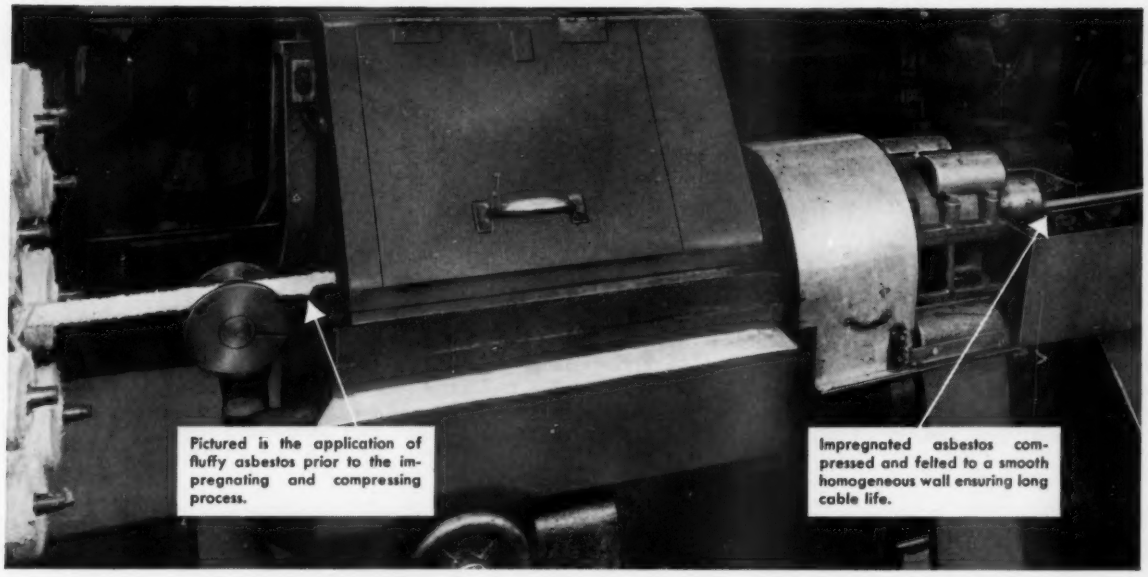
Put Armco FLEX-BEAM Guardrail to work inside and outside *your* plant at key points like plant entrances, parking lots, aisleways, structural supports for your buildings, and around valuable machinery and equipment. Write us for complete information about Armco FLEX-BEAM Guardrail. Armco Drainage & Metal Products, Inc., 3637 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Wandering trucks cannot damage this important production equipment. FLEX-BEAM provides complete protection. Guardrail also makes definite separation of work area and busy traffic aisle.

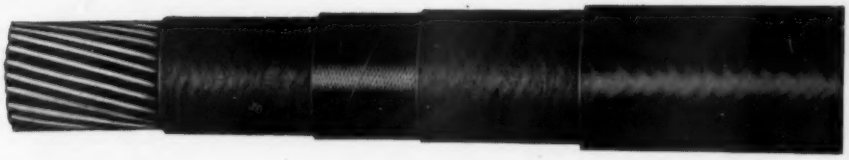
Armco FLEX-BEAM Guardrail

ARMCO®

For more facts circle 574 on Reply Card


Pictured is the application of fluffy asbestos prior to the impregnating and compressing process.
Impregnated asbestos compressed and felted to a smooth homogeneous wall ensuring long cable life.

Felted Asbestos Walls + Impregnation with Selected Compounds + Quality Varnished Cambric Tapes . . .



That's the Backbone of

ROCKBESTOS A.V.C.® (N.E.C. TYPE AVA) QUALITY

Different brands of N.E.C. Type AVA wire and cable may look alike on the surface but the sure proof of quality that means dependable service is beneath the braid.

In the Rockbestos A.V.C. construction dense, felted, thoroughly impregnated asbestos walls seal the varnished cambric tapes away from air and moisture.

The varnished cambric tapes are made to Rockbestos exacting specifications and are applied under controlled methods assuring uniform dielectric strength.

The result . . . you get long life and dependable service under every type of operating conditions . . . in temperatures up to 230°F.

Complete construction and test specifications of Rockbestos A.V.C. are in the new booklet: "Specifications RSS-88". Write for your copy.

ROCKBESTOS PRODUCTS CORPORATION
NEW HAVEN 4, CONNECTICUT
NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS
LOS ANGELES • NEW ORLEANS • OAKLAND, CALIFORNIA • SEATTLE

STOCKED COAST TO COAST
Standard Rockbestos A.V.C. construction (N.E.C. types AVA, AVB, etc.) are available for immediate shipment. Call or write nearest branch office.

For more facts circle 575 on Reply Card

10-TON JIB CRANE SPEEDS HANDLING FROM YARD TO MACHINE SHOP

One of the big railroads had the problem of moving car wheels and other equipment from the yard to the machine shop. Shaw-Box provided the answer with this special jib crane that revolves through a complete circle. The jib is 27′ - 4″ long and the distance from ground level to jib is 27′ - 6″. With a 10-ton 'Load Lifter' Electric Hoist and motor-driven trolley installed, loads can be quickly lifted 22 feet.

This is but one example of how Shaw-Box meets special load handling requirements for industry. Standard full revolving, self supporting 'Load Lifter' Jib Cranes are available for use on small assembly floors, at machine tools, in molding bays, at degreasers, on loading docks and so on. They are ideal for any spot where there is no crane service or where the overhead crane is always on the go.

The great work area a single 'Load Lifter' Jib Crane can serve increases efficiency and cuts handling costs. *Your Shaw-Box Distributor will gladly give you complete details or write us for Bulletin 383.*

'Load Lifter' Jib Crane, Type LC-SSJ. Bolts to the floor. Revolves smoothly through a complete circle. Serves up to 550 sq. ft. of floor area. Capacities ¼ to 2 tons.

'Load Lifter' Jib Crane, Type SSJ. For heavy-duty service. Sets in a floor-level concrete foundation. Full revolving. Serves up to 1500 sq. ft. of floor area. Capacities 1 to 5 tons.

'Load Lifter' Wire Rope Electric Hoists. Built in all proper capacities for use on 'Load Lifter' Jib Cranes. Add fast lifting action to jib crane service — at the push of a button. Two automatic brakes for double safety. Available with push-type or motor-driven trolley.

57 H-1

'Load Lifter'® JIB CRANES

MANNING, MAXWELL & MOORE, INC.

SHAW-BOX CRANE & HOIST DIVISION

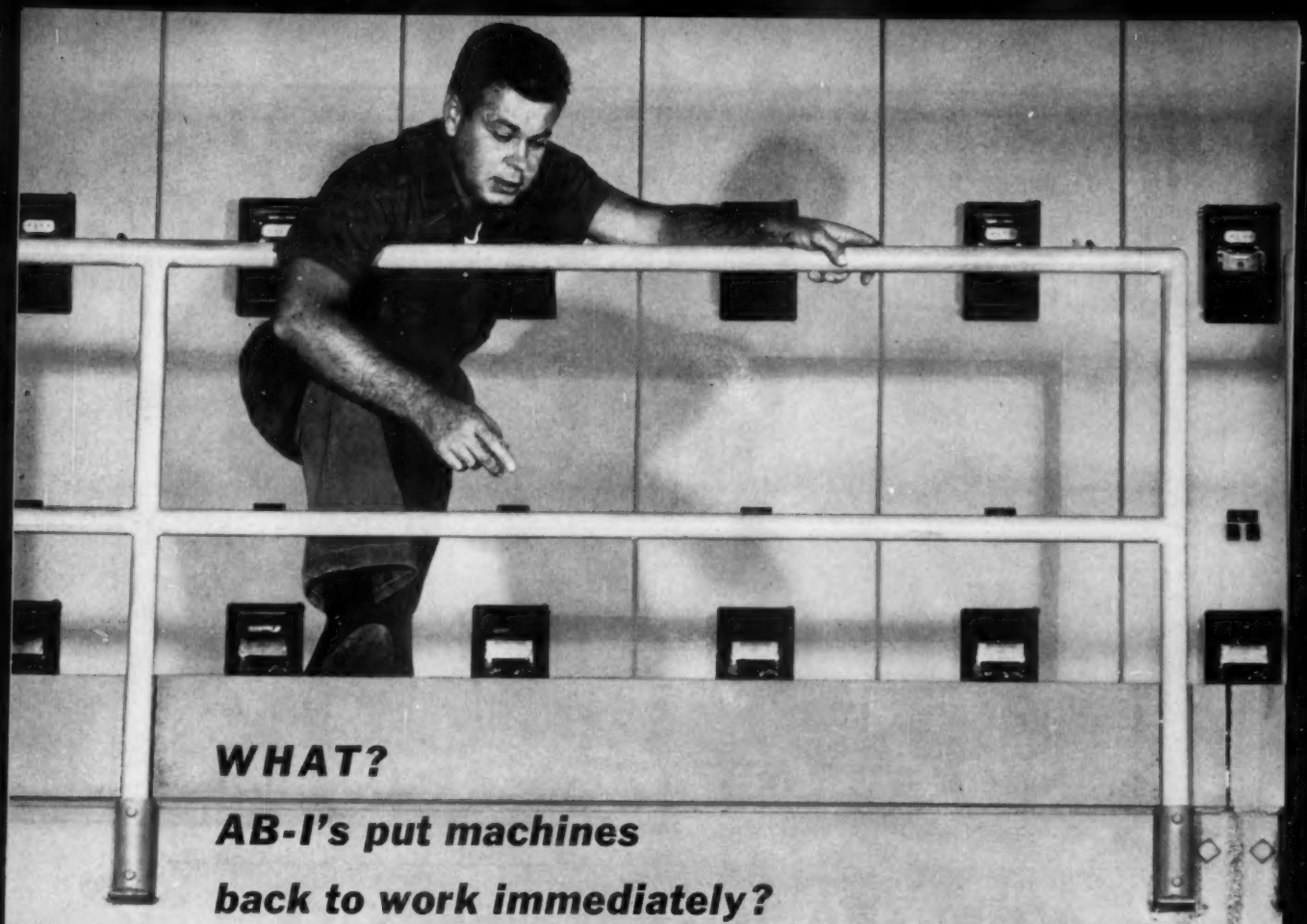
362 West Broadway • Muskegon, Michigan

Builders of "SHAW-BOX" and 'LOAD LIFTER' Cranes, 'BUDGIT' and 'LOAD LIFTER' Hoists and other lifting specialties. Other Divisions produce 'ASHCROFT' Gauges, 'HANCOCK' Valves, 'CONSOLIDATED' Safety and Relief Valves, 'AMERICAN' and 'AMERICAN-MICROSEN' Industrial Instruments, and Aircraft Products.

In Canada: *Manning, Maxwell & Moore of Canada, Ltd., Avenue Road, Galt, Ontario.*

For more facts circle 576 on Reply Card

For more facts circle 577 on Reply Card →



WHAT?

AB-I's put machines back to work immediately?

LIKE LIGHTNING. And in many cases Westinghouse AB-I circuit breakers cost less than safety switches.

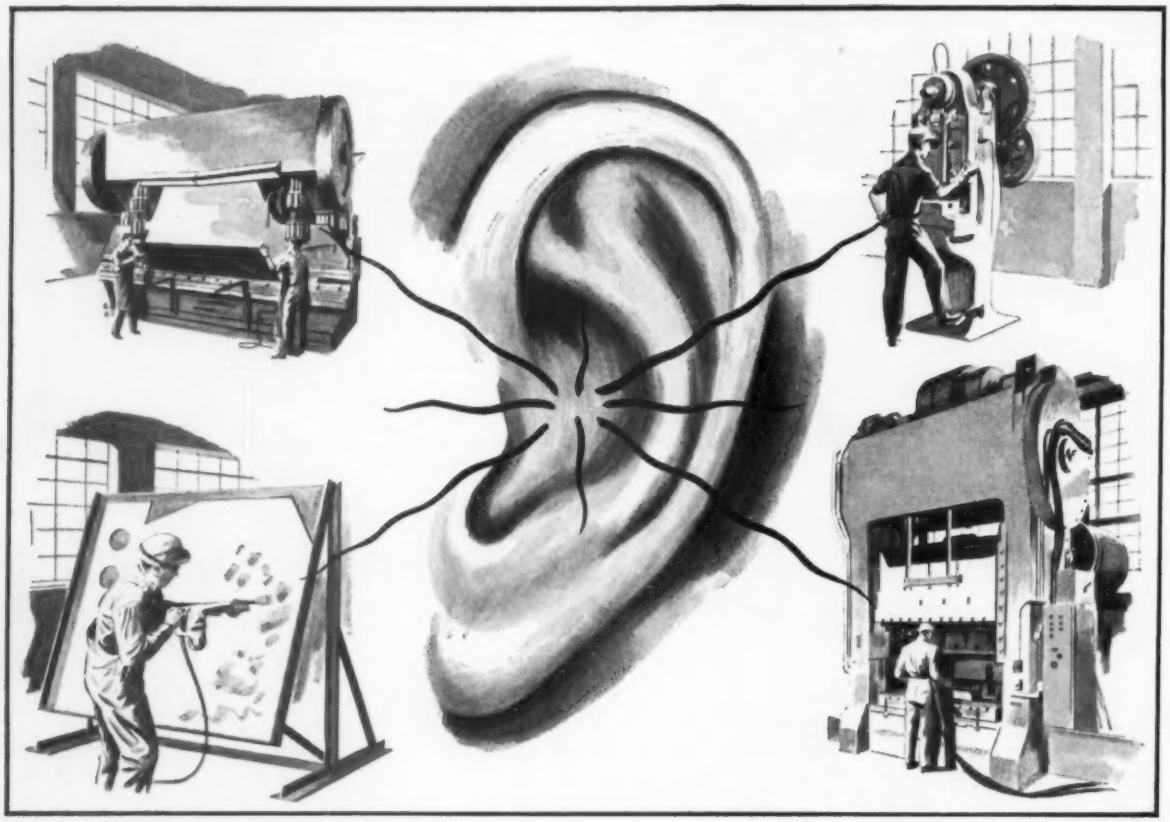
With no fuses to replace, no waiting for authorized personnel to correct the fault, anyone can restore service. A flip of the handle does it. If the fault lingers, the exclusive De-ion® arc quencher goes into action again.

Can you afford the lost production, the lost profit caused by down time, even temporary down time caused by harmless overloads? When fuses blow, temporary faults take just as long to correct as serious ones.

AB-I circuit breakers are the modern successor to the fused switch. No other protective device can match Westinghouse AB-I's for performance, quality and economy. For further information ask your Westinghouse distributor for Descriptive Bulletin 30-250 or write Westinghouse, P. O. Box 868, Pittsburgh 30, Pa. J-30226

YOU CAN BE SURE...IF IT'S

Westinghouse



KOPPERS "SILENCE SERVICE" Eliminates Cost-Consuming Noise

Improves Communications. Prevents Hearing Damage to Employees. Increases Employee Efficiency, Morale.

Noise costs you money because it reduces the production output per worker and, in many cases, the actual working period per worker. Koppers "Silence Service" can eliminate profit-eating, production-interfering noises that impair the efficiency and health of your workers.

Koppers "Silence Service" engineers analyze your plant's individual noise problems . . . then custom-design equipment that meets your specific requirements . . . and install that equipment quickly and economically. These units are simple to maintain . . . provide years of trouble-free performance.

Effective noise control in industry demands acoustical "know-how" and facilities. Koppers engineers have silenced jet engines, drop hammers, punch presses and many other types of industrial noises. Koppers backs up its field staff with one of the largest privately owned acoustical research laboratories in the United States.

Those plant noises you may be taking for granted are cutting a good-sized chunk out of your profits. Discover how you can eliminate these costly noises quickly and economically. Write to KOPPERS COMPANY, INC., Industrial Sound Control Dept., 7502 Scott Street, Baltimore 3, Maryland.

KOPPERS INDUSTRIAL SOUND CONTROL EQUIPMENT FOR EVERY NEED

- **Machinery Enclosures**
- **Acoustiphone Booths**
- **Portable Sound Barriers**
- **Soundproof Doors**
- **Soundproof Rooms**
- **Audiometric Rooms**

KOPPERS

INDUSTRIAL SOUND CONTROL

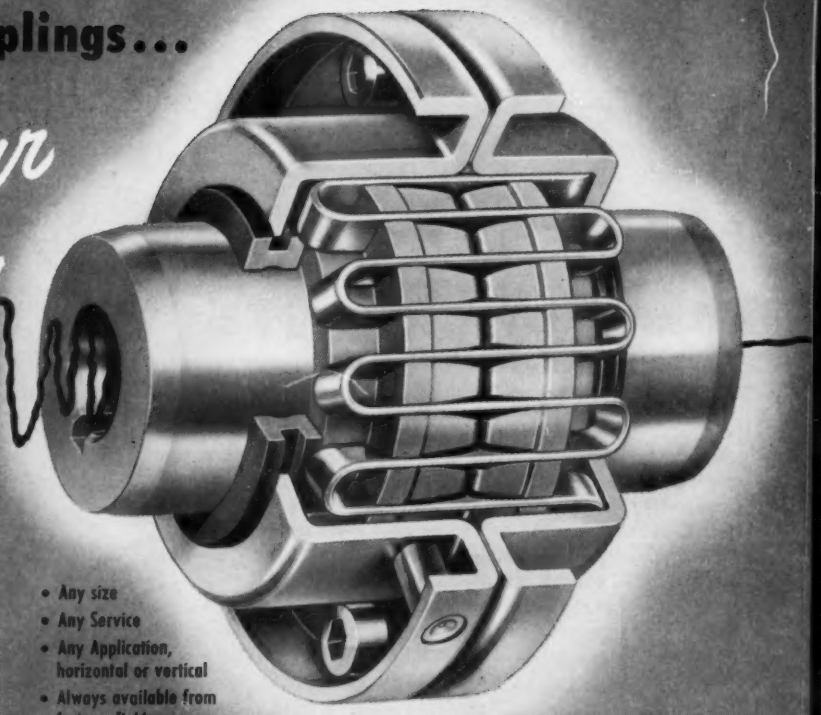
Koppers Company, Inc., Metal Products Division
Industrial Sound Control Department

Engineered* Products Sold with *Service

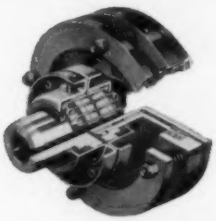
For more facts circle 578 on Reply Card

Falk Steelflex Couplings...

Protect your machinery in 2 ways



- Any size
- Any Service
- Any Application, horizontal or vertical
- Always available from factory, field or distributor stocks

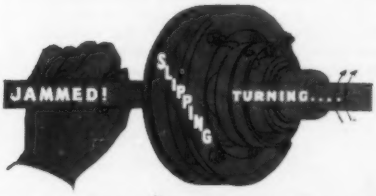


Falk Controlled Torque Couplings prevent damage from overloads

In applications where danger from overloads exists, use the FALK Type FT Controlled Torque Coupling. The Type FT has all the features and advantages of standard FALK Steelflex couplings—and, in addition, has an adjustable friction slip clutch, enabling the operator to set the coupling to slip at any predetermined overload.

This controlled-torque principle not only prevents transmission of dangerous shocks and limits overloads; it eliminates the breaking of shafts caused by jamming of driven equipment.

An outstanding advantage of the Type FT Coupling is that, as soon as the cause of the overload is removed, the entire coupling will rotate and transmit power without replacing parts or repairing coupling.



There's real economy in using Type FT Controlled Torque Couplings. Many users have reported that these couplings paid for themselves the very first time they slipped (under overload) because of the protection against damaged driving or driven machinery!

...cost less per year of service!

You get *double protection* when you connect your driving and driven machinery with a Falk Steelflex Coupling—the all-steel coupling with the exclusive grid-groove design! First, its *torsional resilience* smothers shock and vibration; and second, the Steelflex design prevents damage and lowered efficiency by accommodating shaft misalignment.

Why have increasing numbers of key men in industry standardized on Falk Steelflex Couplings? Their experience has proved that Falk Steelflex Couplings prolong the service life of their machinery... are trouble-free and need minimum maintenance . . . are easy to install, lubricate and disconnect . . . and *cost less per year of service* than ordinary couplings.

One basic Steelflex design—the type F, in its many sizes—is adaptable to more than 90% of all industrial applications. For applications involving danger from overloads, Modified Type FT Controlled Torque couplings (see column at left) are ideally suited. There are numerous other special or dual purpose Steelflex couplings for unusual applications. **Write to Department 247** for engineering bulletin, including selection and dimension tables.

THE FALK CORPORATION, MILWAUKEE, WISCONSIN

FALK

...a good name in industry

MANUFACTURERS OF:

- Motoreducers
- Speed Reducers
- Flexible Couplings
- Shaft Mounted Drives
- High Speed Drives
- Special Gear Drives
- Single Helical Gears
- Herringbone Gears
- Marine Drives
- Steel Castings
- Weldments
- Contract Machining

For more facts circle 579 on Reply Card

can VIBRATION MEASUREMENTS

Help You ?

Vibrations cause discomfort and fatigue and, in extreme cases, can bring about actual failure of structural materials. Conversely, they are helpful too, making possible vibrating systems such as the electro-dynamic shaker for testing components and equipment. Whether wanted or unwanted, vibrations must be measured to obtain a thorough understanding of their characteristics and potentialities. Such measurements are accomplished accurately and with ease and rapidity by the G-R Vibration Meter and Vibration Analyzer.

The Vibration Meter measures motion directly in terms of its displacement, velocity, and acceleration. The piezoelectric type of pickup used permits a frequency range of 2 to 1000 cps (120 to 60,000 rpm), covering the spectrum in which vibrations are most often encountered. The instrument is mounted in a portable case, operates from an internal battery, and is simple and easy to use.

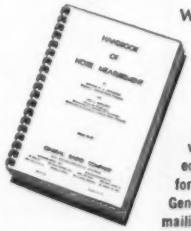
MARINE ENGINE MEASUREMENTS — PHOTO COURTESY GENERAL METALS CORPORATION

The Vibration Analyzer is a continuous spectrum instrument, invaluable for determining the contribution made by specific frequencies to the over-all disturbance. "Broad" and "Sharp" bandwidths are provided for either scanning or for detailed measurements over the range from 2.5 to 750 cps (150 to 45,000 rpm). The complete analysis made possible by this instrument provides the clues to the sources of the various components and gives information necessary for the suppression of the vibration.

. . . They Helped Here!

- The Vibration Meter is widely used for evaluating the effectiveness of shock and vibration mounts and cushioning for high-speed automatic machinery.
- A tire manufacturer uses this measuring equipment to determine accurately the amount of vibration absorbed by auto tires.
- Resonant vibrations in large engine foundations have been analyzed with success. The frequency spectrum of the disturbance gives a most helpful indication of the offending gear, pinion, or other part.
- Field measurements on marine and stationary engine installations are extremely valuable safety measures; they help predict troubles brought about by excessive torsional vibrations.
- Ball bearing manufacturers rely on vibration measurements to test the finished product as it comes off the production lines.
- Noise levels of several popular fans and air circulators have been reduced to acceptable levels through vibration study.
- Measurements on newly completed vehicles, ships, and large fixed structures are necessary to check design calculations.
- Excessive building vibrations produced by engine and heavy-machinery operations on upper floors have been reduced as a direct result of investigations conducted with the G-R Vibration Meter and Analyzer.
- Rotational vibrations of electrical machines and generators can be determined with the aid of two vibration pickups and a simple summing circuit which feeds the Vibration Meter.

Write for Complete Specifications



Many of the applications briefly described above are discussed in detail in the G-R Handbook of Noise and Vibration Measurement. This comprehensive publication of well over 160 pages thoroughly covers the subjects of noise and vibration measurements; it describes standard measuring equipment and techniques, and gives definitions and procedures for interpreting results. The booklet is available from the General Radio Company at a cost of $1.00 to cover printing and mailing charges only.

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Mass., U.S.A.

Broad Avenue at Linden, Ridgefield, N. J. **NEW YORK AREA** 920 S. Michigan Ave. **CHICAGO 5**

1150 York Road, Abington, Pa. **PHILADELPHIA**

8055 13th St., Silver Spring, Md. **WASHINGTON, D. C.** 1000 N. Seward St. **LOS ANGELES 38**

For more facts circle 580 on Reply Card

For more facts circle 581 on Reply Card

the BUCYRUS ERIE 30-B

Big work output and operating efficiency you can depend on . . . YEAR AFTER YEAR

Here's a brand new 1-yd. profit-maker for you — the Bucyrus-Erie **30-B**. Offered with either crawler or rubber-tired carrier mounting, it's readily convertible to various front ends — shovel, dragshovel, dragline, crane, or clamshell.

New . . . fast . . . quality-built, the **30-B** is just what you need for dependable, low-cost performance in yard handling operations. Check the brief rundown of features given below; then request full details.

Matched to your needs

- Your choice of diesel, gasoline, or single-motor electric power. Direct or torque converter drive.
- Five easily-converted front ends — shovel, dragshovel, crane, dragline and clamshell.
- Your choice of five crawler mountings *plus* Transit Crane on rubber-tired carrier.
- Extra equipment for special jobs—independent propel, third drum unit, and cathead.

Designed to out-perform

- Easy, air control for smooth, big-output working cycles.
- Easy to service — automatic lubrication of many parts.
- Large, cool-running clutches and brakes.

Built to outlast

- Six conical hook rollers distribute loads evenly between upper and lower works to save wear.
- Five main operating clutches are alike, with parts interchangeable.
- Specially-processed steels add strength and wear resistance.
- Strong, rigid cast revolving frame withstands twisting and bending stresses, maintains machinery alignment.

252E56C

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

BUCYRUS-ERIE COMPANY
South Milwaukee, Wisconsin

Gentlemen: Please send me details on the new 30-B.

Name _____

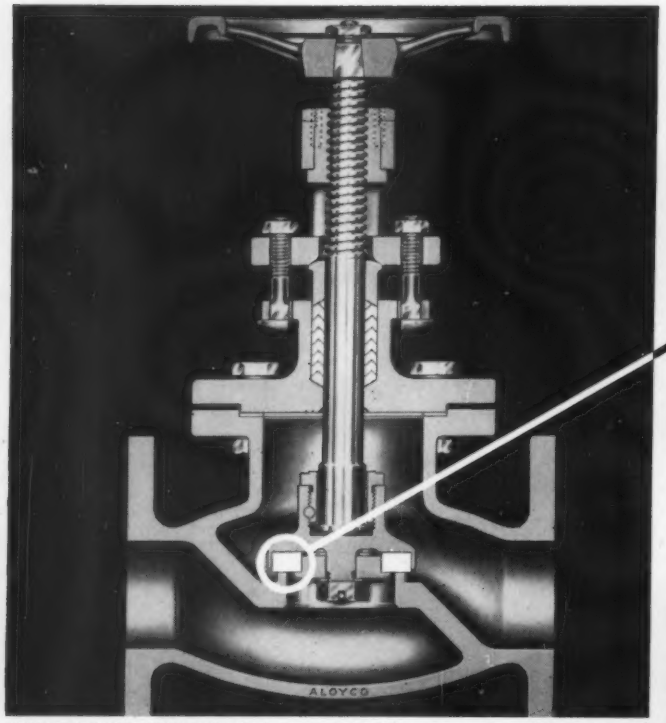
Organization _____

Address _____

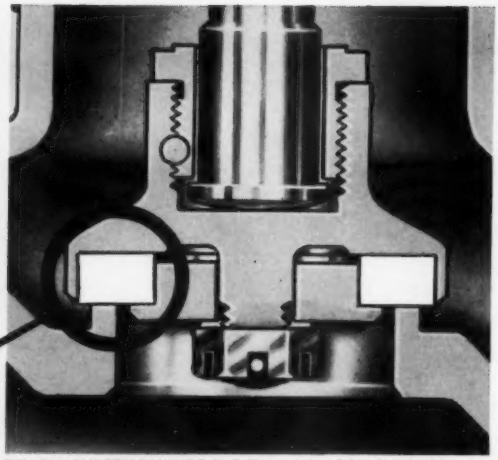
City _____ State _____

252E56C

Send for complete facts NOW!



150 LB. ALOYCO GLOBE VALVE features bolted bonnet, and outside screw and yoke construction which keeps stem threads out of contact with corrosive fluids. Two piece gland plates and followers. Sound, heavy section body and bonnet castings. Stainless bolts. Heavy finished stem. Renewable yoke bushing. Flanged or screwed ends.



RENEWABLE TEFLON DISC is fully retained in disc holder so that even heavy overloads can't force it out of place. Machined seating surface assures wide full contact with disc and protects against distortion. Teflon V-type chevron packing rings are also used in deep stuffing box.

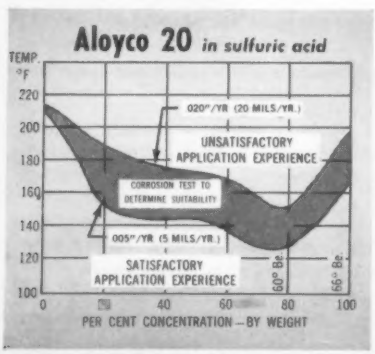
Tips on selecting valves to combat oxidizing solutions

High chromium and chromium-nickel stainless steels are the best alloys for these corrosive applications.

When exposed to oxidizing solutions they form protective films which restrain corrosive attack. Aloyco 18-8S, 18-8S mo and Aloyco 20 are good examples.

Valves should be constructed so that slight wear or corrosion won't require costly valve replacement. Renewable seats or discs shown above are one answer to this problem. So are deep stuffing boxes and outside screw and yoke construction. And, of course, all valve parts that come in contact with the corrosive fluid should be alloy steels. 6.18

ALOYCO STAINLESS STEEL 18-8S (type 304) is expressly suited for resistance to oxidizing solutions. It also lends itself to innumerable other applications to prevent product contamination or discoloration. In Aloyco 18-8S mo (type 316), molybdenum is added to increase resistance to attack by pitting.

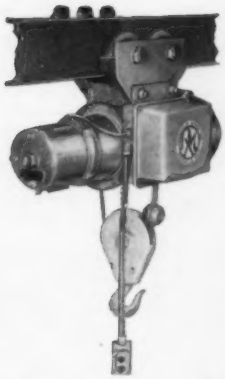


ALOYCO 20 provides a high order of corrosion resistance to a wide range of sulfuric acid concentrations at varied temperatures as indicated by the graph above.

ALOYCO TECHNICAL SERVICE includes engineering counsel, metallurgical assistance and field service. Samples are being prepared for plant line test above.

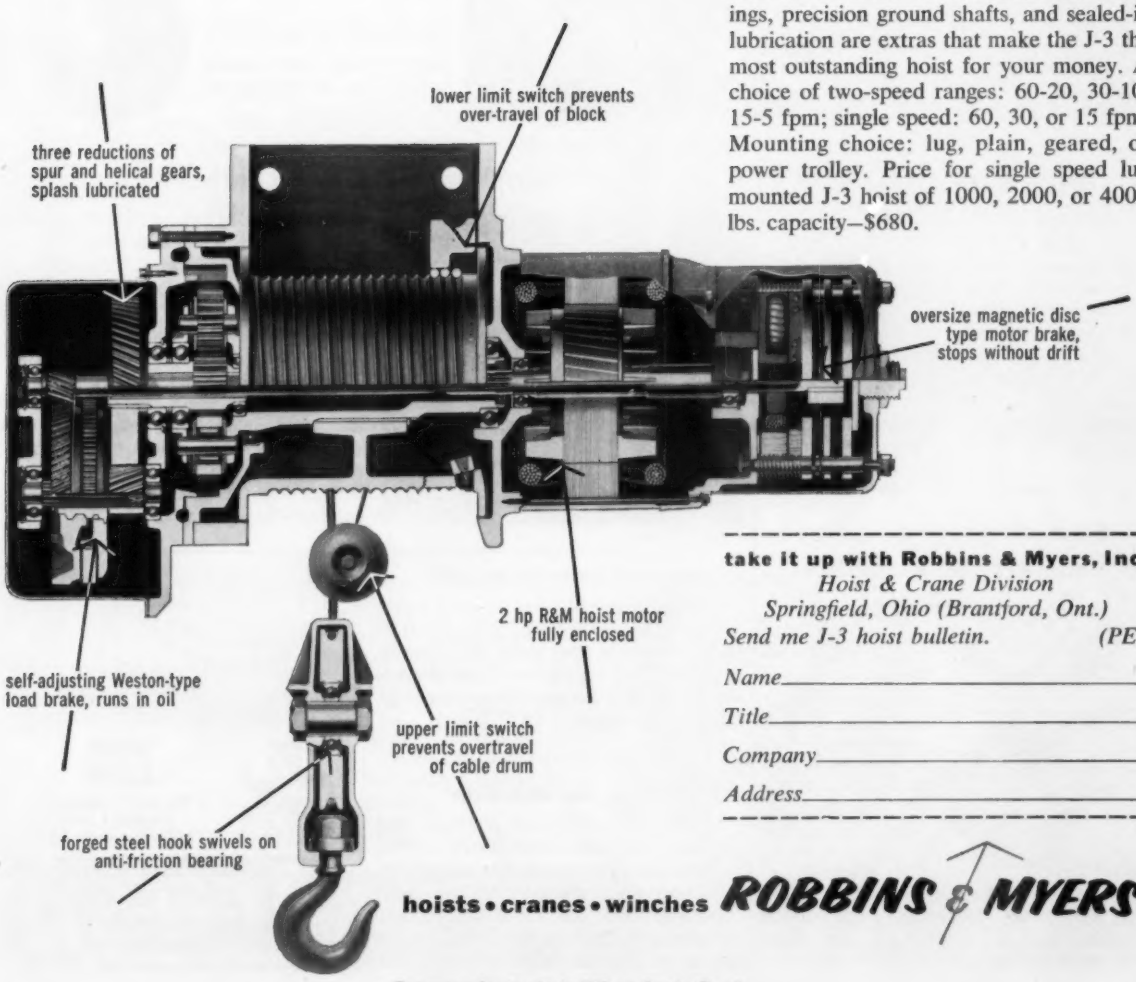
FOR FURTHER INFORMATION on Aloyco corrosion-resistant valves, write to Alloy Steel Products Company, 1308 West Elizabeth Avenue, Linden, New Jersey.

For more facts circle 582 on Reply Card



too much hoist?

R&M J-3 hoists have specific points of superiority that go beyond what hoist users usually consider "adequate." The 2 hp R&M high torque hoist motor, designed and built for full-time, full-load hoist duty, has the highest motor rating found in any standard hoist (30 min., 55 degrees C.), giving it ample reserve for accidental overloads. Power is transmitted through three reductions of cut helical and spur gears, instead of the usual two. Oversize ball bearings, precision ground shafts, and sealed-in lubrication are extras that make the J-3 the most outstanding hoist for your money. A choice of two-speed ranges: 60-20, 30-10, 15-5 fpm; single speed: 60, 30, or 15 fpm. Mounting choice: lug, plain, geared, or power trolley. Price for single speed lug mounted J-3 hoist of 1000, 2000, or 4000 lbs. capacity—$680.


lower limit switch prevents over-travel of block
three reductions of spur and helical gears, splash lubricated
oversize magnetic disc type motor brake, stops without drift
2 hp R&M hoist motor fully enclosed
self-adjusting Weston-type load brake, runs in oil
upper limit switch prevents overtravel of cable drum
forged steel hook swivels on anti-friction bearing

take it up with Robbins & Myers, Inc.
Hoist & Crane Division
Springfield, Ohio (Brantford, Ont.)
Send me J-3 hoist bulletin. *(PE)*

*Name*_____
*Title*_____
*Company*_____
*Address*_____

hoists • cranes • winches **ROBBINS & MYERS**

For more facts circle 583 on Reply Card

Materials-Handling News

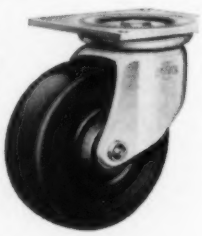
NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

Bassick casters speed order filling by 50% here

Hibbard, Spencer, Bartlett & Company, one of the nation's five largest wholesale hardware jobbers, moves 15,000 items of open bin stock and over 8500 heavy packages a day.

They do it with 420 Bassick caster-equipped tow carts (left) and 2900 feet of dragline. Before casters, incidentally, they used to have girls on roller skates trying to fill the orders. Now in their modern 20-acre plant, the Bassick casters help them "reduce the manpower ordinarily needed with such a vast area to cover, as well as speeding up by 50% the actual filling of orders."

The same casters are in use on these carts today that were installed 10 years ago. Maintenance has consisted of lubrication about once a year. That's what we mean by trouble-free, economical performance of Bassick casters. Bassick has designed the ideal casters for the fast developing use of dragline trucks.



High-level operation

Designed for either production or maintenance work at heights, this Ballymore Hydraulic Lift Work Platform rolls easily and safely to the job on smooth-rolling, easy swivelling Bassick casters.

Bassick grooved wheel casters for assembly systems

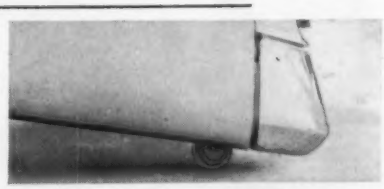
Operating on strong, inexpensive self-cleaning angle iron tracks, Bassick grooved wheel casters are widely used in industrial assembly line systems. Benefits include better utilization of floor space, protection of floors, and easy, economical handling of heavy loads. There's a Bassick grooved wheel caster for almost any application. Might be an idea here for you.

Bottles ride Floating Hubs

Waiting for baskets of bottles at Beech-Nut Foods Division of Beech-Nut Life Savers Inc. at Canajoharie, N. Y., are Bassick-equipped triangular dollies. Babying big baskets of bottles is a job that calls for shock-absorbing Bassick Floating Hub Casters. Their spring-controlled wheels roll up and over obstacles while the load rides smoothly. And because of their ability to snub out shock and vibration, Bassick Floating Hub Casters are good for rugged duty over rough floors and ground or for high-speed applications where caster-equipped trucks are pulled by tractors.

Unusual caster use pays off

This man's driveway was too steep for his new car—the rear end used to scrape as he backed down the steep grade. He welded a heavy duty caster to the rear frame. The new fifth wheel takes the shock, raises the body, solves the problem.



Talk to your distributor

Speaking of casters and problems, why not take a new look at your plant's handling methods and your portable equipment. Maybe there's some new way Bassick casters could help. There is a local Bassick distributor who carries Bassick casters in stock and can be of assistance to you. 7.7

THE BASSICK COMPANY
Bridgeport 2, Conn.
In Canada: Bellville, Ont.

Bassick
A DIVISION OF
STEWART SW WARNER

MAKING MORE KINDS OF CASTERS... MAKING CASTERS DO MORE

For more facts circle 584 on Reply Card

ULTRACOUSTIC reduces noise level of compressor station 50%!

Compressor stations create **big, big** noise problems.

The best *solution* is ULTRACOUSTIC, an exclusive Gustin-Bacon glass fiber acoustical insulating blanket. Quickly and economically, continuous, wide ULTRACOUSTIC blankets are applied to exhausts, walls and ceilings. Result: a 50% reduction in the noise level that makes conversation possible, and improves employee comfort and efficiency. Far better than words, these sound absorption coefficients tell why ULTRACOUSTIC is being selected to solve the really tough acoustical problems throughout industry:

ULTRACOUSTIC THICKNESS	SOUND ABSORPTION AT FREQUENCIES						NRC
	125	250	500	1000	2000	4000	
3"	.43	.91	.99	.98	.95	.93	.95

. . . and in the speech interference range (600-4800 cps), ULTRACOUSTIC also has an NRC rating of .95+!

Write Today for Technical Data and Application Information

GUSTIN-BACON

Manufacturing Company GUSTIN gb BACON

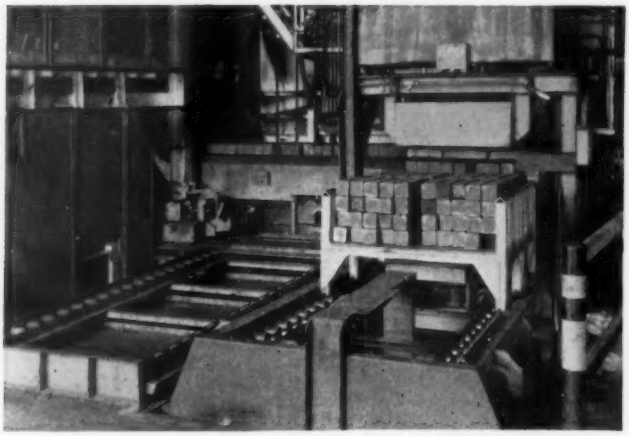
Thermal and acoustical insulations • Molded glass fiber pipe insulation
Pipe couplings and fittings

244 W. 10th St., Kansas City, Mo.

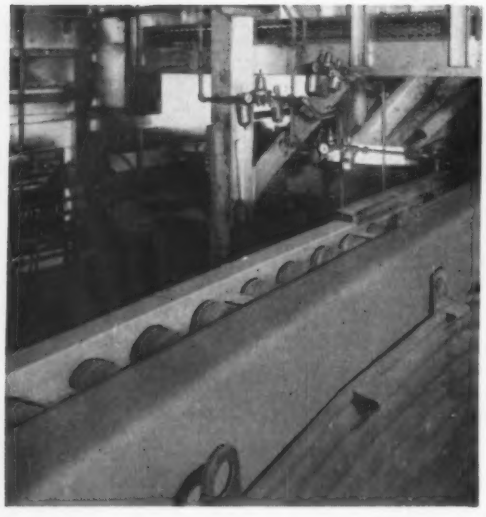
For more facts circle 585 on Reply Card

Hand Handling Eliminated On 6000 Ton Forging Press Line By Planet System

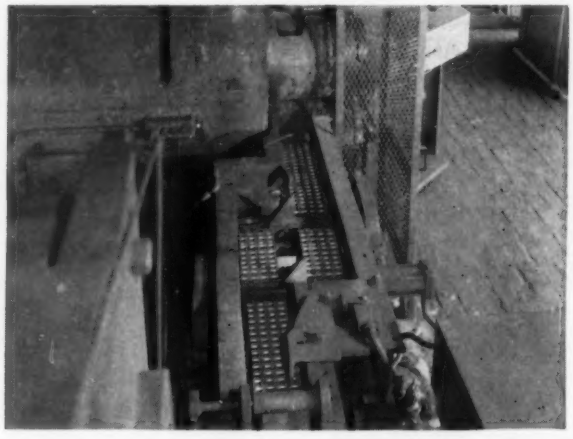
Billets Moved in Continuous Flow From Furnace Through Trimming Operations While Still in Forging Temperature Ranges



In this system, which was recently installed in a large automotive forge plant, a steady flow of billets is insured by the automatic rack unloader. This unit feeds billets automatically into the furnace and moves empty racks away for pick-up.



Hot billets are carried rapidly and in a continuous flow from furnace to the first reducer roll by a powered roller conveyor.



From reducer rolls hot billets are moved to presses, and enroute are turned by roller chain repositioning unit.

Let Planet Help Solve Your Handling Problems — Write or Phone Today
"IT PAYS TO PLAN WITH PLANET"

PLANET CORPORATION

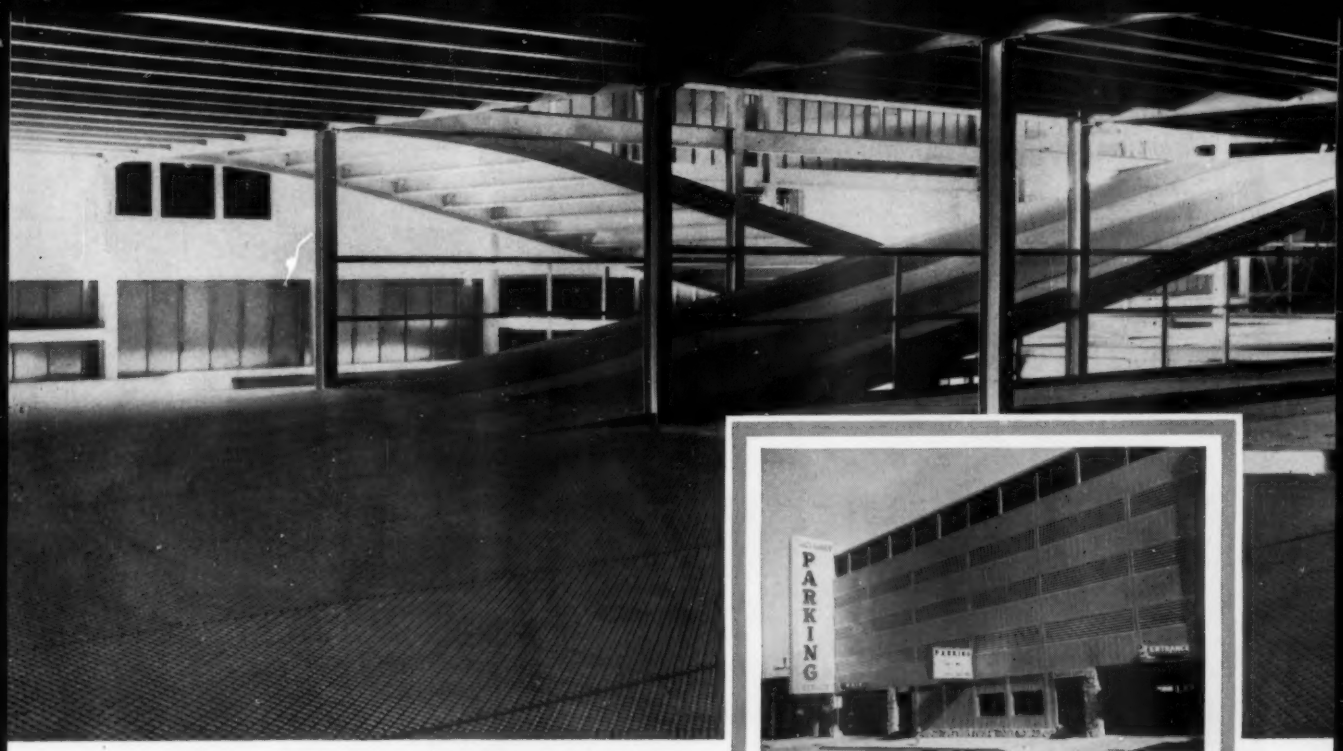
1840 SUNSET AVE., LANSING, MICH.

- **ENGINEERED HANDLING SYSTEMS**
- **AUTOMATED EQUIPMENT**
- **FOUNDRY HANDLING SYSTEMS**

68

For more facts circle 586 on Reply Card

For more facts circle 587 on Reply Card——→



The Multigrip Floor Plate offers long service with minimum maintenance. Its evenly spaced, flat-topped risers give excellent traction—from any direction, thus drastically reducing slipping accidents.

Exterior of this five-story garage consists of porcelain-enameled sheets. Built almost entirely of steel, the garage was finished in just seven weeks. It accommodates 300 cars in the heart of Las Vegas.

In Las Vegas . . . 5-story, Multigrip-decked garage built in 7 weeks!

300 much-needed parking places smack in the heart of busy Las Vegas . . . in just 7 weeks. That's the story of the Jack Harris Parking Garage*. This five-story "park-on structure" is made almost entirely of steel, much of it in prefabricated sections.

USS Multigrip Steel Floor Plate was used for almost the entire floor area. To speed construction, floor sections were fabricated from I-beam supports covered with ¼" Multigrip Floor Plates. Thus, it was possible to swing whole sections of flooring into place in one simple operation.

Traction and Toughness

Multigrip's evenly spaced risers are important safety factors in this garage. Their flat-topped, clean-edged risers provide traction from any direction for car wheels and feet. And the Multigrip Floor Plate will stand up for years under 24-hour-a-day wear. It won't chip, crack or splinter, even under the ton-plus weight of automobiles.

Easy Fabrication

Prefabricating the Multigrip sections was no problem. That's because this rugged floor plate is available in large sections—minimizing cutting waste. It can be bent, formed, cut or welded with ease. If safety, durability and ease of fabrication are important factors in planning *your* plant flooring . . . specify USS Multigrip Steel Floor Plate.

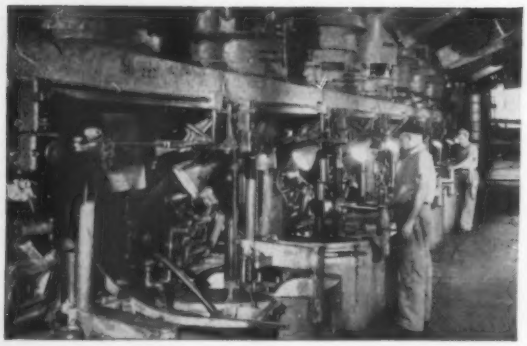
**Fabricator*—American Bridge Division
Architects—Messrs. W. Zick & H. Sharp, Las Vegas
Design Engineer and Contractor—Ellis E. White Co., Beverly Hills

UNITED STATES STEEL CORPORATION, PITTSBURGH
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION, CHICAGO
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

USS multigrip
FLOOR PLATE

Sold by leading distributors from coast to coast

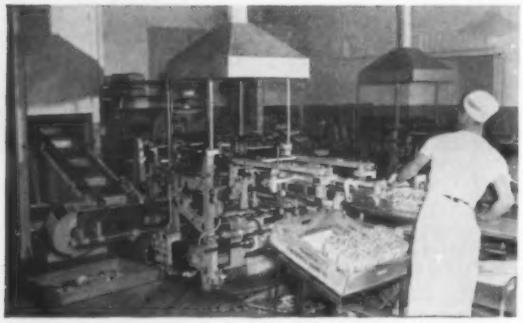
UNITED STATES STEEL



Protecting syrup against carmelizing *at American Molasses Co. is the responsibility of Honeywell temperature and pressure controllers working with a* ***Modutrol*** *valve. The controllers are interlocked so that burning in the heater is prevented, and product quality is safeguarded.*

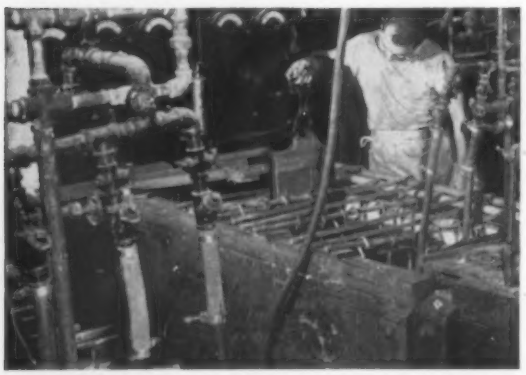
Honeywell Controller Cost—$215.00

Honeywell Industrial Controls



Air-conditioning bread as it cools *helps the Continental Baking Co., Portland, Oregon, to protect palatability. Honeywell Proportioning Temperature Controllers and Humidistat regulate sprays and air dampers to keep conditions right.*

Honeywell Controller Cost—$50.00



Plating solutions *are held at correct temperature for best quality of finished electrotypes, at the Kingsboro Electrotype Corp., Brooklyn, N. Y. . . . by means of Honeywell Remote Bulb Controllers.*

Honeywell Controller Cost—$29.00

improve quality

Don't overlook these simple, low-cost controllers...they're the ideal solution to hundreds of problems.

IN PRACTICALLY any plant, there are dozens of spots where simple, inexpensive Honeywell Industrial Controls can be put to work to improve the quality of production. The examples pictured here give only a few of the ways that this versatile family of controls can regulate temperature, pressure, vacuum, liquid level and humidity . . . the variables that directly affect quality of finished goods.

For your specific application, you can choose from more than 7000 different models in the Honeywell Industrial Controls line. All are simple in design, rugged in construction, modest in price. All are backed by the precision manufacturing know-how and extensive application experience of the world's largest manufacturer of controls. In addition to improving quality, these controls can also be relied on to increase production, reduce maintenance, increase safety and cut costs.

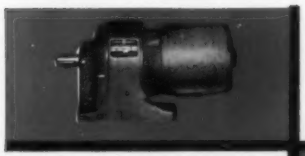
Ask your local Honeywell sales engineer to discuss how you can apply these controls in your own plant. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Wayne and Windrim Avenues, Philadelphia 44, Pa.—in Canada, Toronto 17, Ontario.

Also manufacturers of a complete line of precision measuring, recording and controlling instruments.

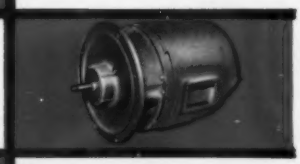
MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS
First in Controls

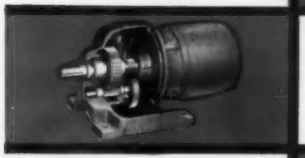
NOW! Speed reduction with space reduction



UTMOST COMPACTNESS is provided by flanged connection of motor to gear drive.

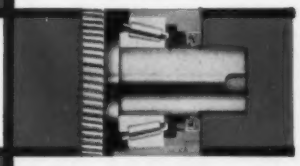
STANDARDIZED FLANGE (one size per motor) permits use of more universally applicable motor.

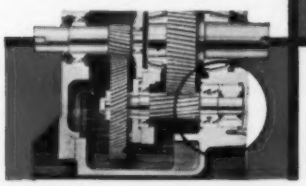




BUILT-IN ALIGNMENT is provided through use of the rabbet-fit NEMA motor flange.

EFFECTIVE SEALS at all shaft openings keep oil in and prevent dirt from entering housing.





INTEGRAL BACKSTOP to prevent reverse rotation. Can be installed at any time without additional parts or modifications.

LINK-BELT GEARMOTORS maintain positive alignment with flange-mounted NEMA motors

Here's space-saving speed reduction that's made-to-order for tight drive locations. First, because the speed reducer itself is extremely compact, thanks to Link-Belt's advanced gearing methods. Second, the motor is flange-mounted, with no need for coupling devices.

In response to the tremendous demand for these new Gearmotors, Link-Belt can now offer delivery from stock for sizes up to 30 hp, speeds from 280 down to 6 rpm. For details, contact your Link-Belt office or authorized stock-carrying distributor.

Ask for new 28-page Book 2447—offering details of design highlights plus complete engineering data.

LINK-BELT

THE SYMBOL OF QUALITY — LINK-BELT

ENCLOSED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,917

For more facts circle 589 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

Reader Service Cards on pages 205-206 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

1—PLUG-IN BUSWAY is low-voltage-drop system

Type LVDP Busway is designed for use in industrial plants where high-capacity and low-voltage-drop characteristics are necessary in conductors feeding welders and similar equipment and in multi-story buildings where frequent power tap-offs are required. Low power loss and low-voltage-drop characteristics are obtained by interlacing closely-spaced bus bars in recurring sequence with no adjacent bus bars having the same polarity.

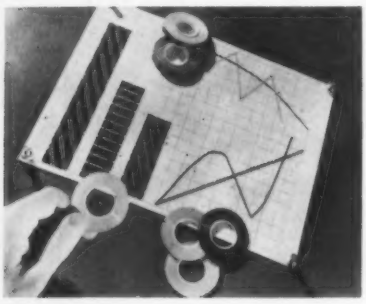
The new busway is for three-pole applications and is rated from 600 to 4000 amp, 600 v or less. It comes in standard 10-ft straight lengths, each with 10 plug outlets, five on each side, with either aluminum or copper bus bars. According to manufacturer, installation costs for this busway are lower than for most conventional low-voltage-drop feeder systems utilizing cable tap boxes for tap-offs. Type LVDP Busway is interchangeable with company's LVD Feeder Busway and can be installed in new or existing LVD systems if plug-in tap-offs are required. General Electric Co.

2—HIGH TEMP LUBRICANT with low carbon content

The problem of oil carbon deposits in machines operating at high temperatures is reported to vanish when Keystone 49 Light is used. This oil is claimed to resist oxidation, sludging and breakdown when subjected to severe laboratory and field tests. While developed primarily for air compressor use, the low carbon content and anti-gumming features of the lubricant suggest its use for such applications as: ring bearings in electric motors; multi-plate friction clutches; plastic molding heat transfer systems, others. Keystone Lubricating Co.

3—ACETATE TAPES help make neater graphs, charts

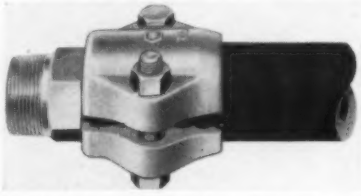
An improved method of graph- and chart-making which results in neater, more attractive and easier-to-reproduce layouts, is based on self-adhesive acetate fiber tapes in various widths, colors and designs. The tapes are readily applied to almost any surface and the narrower widths can be curved. Once made, graphs can be changed by peeling the tape off and replacing with new tape. The tapes come in 15 colors, six widths and nine different striped designs, enabling clear presentation of complex charts having many values and variables.



Tape widths range from 1/32- to 1 in. Tape itself is of Aeroflex core tubing made by Anchor Plastics Co. Aeroflex has a smooth waxy finish and does not delaminate or split, it is noted; and since it is a flexible material, it is not broken or damaged when the tape rolls are squeezed. Also, it is claimed that there is no waste, because every inch of tape on the core can be taken off and used. American Chart Service Co., Inc.

4—HOSE END is versatile, clamp-type unit

This clamp-type hose end provides maximum versatility in high pressure lines for air, hydraulic fluids and steam, it is



announced, and it couples readily on other types of hose. No hose skiving or special tools are needed to install it, company points out, and it may be used repeatedly. Of malleable iron, this hose end is designed to assure free flow and a long-lasting seal. Eight sizes range from ¼ to 2 in. The Weatherhead Co.

5—14-IN. DRILL PRESS is low in cost, easy to use

This economical 14-in. drill press has a full-length belt guard hinged at the rear and counterbalanced, to enable the guard to be swung up out of the way and suspended in that position automatically like the lid of a car trunk, facilitating cleaning and belt changes and improving appearance. It has a pivoting motor mounting plate to permit quick belt tension release to facilitate speed changes and lengthen belt life. Other features include side opening for facilitating spindle removal, and quill allowing 4-5/16-in. spindle travel. The new machine is also designed to accommodate a push-button starter in front as an accessory where front control is desired. Floor model is around $110 east of Rockies. Delta Power Tool Div., Rockwell Mfg. Co.

6—HYDRAULIC BENDERS for pipe and conduit

Models S-137, S-138, S-139 and S-140 for 3- and 4-in. pipe and conduit are styled after manufacturer's popular Model S-130 which handles smaller pipe and conduit. The new models are equipped with company's Optik-Angle gage to eliminate guesswork and afford more accurate bends. This gage speeds making 180-deg

bends, double offsets, compounds and repeat bends. The benders are of rigid, lightweight aluminum with removable top plates for easy pipe positioning. They are designed to work in any position, including overhead. They have long-stroke rams with self-retracting springs to bring the ram to collapsed height quickly. Benders come complete with hydraulic units including hand pump or electrically driven pump. The electric pumps are designed to speed production bends. The Blackhawk Mfg. Co.

7—ROOF VENTILATORS blow air in, not out

Positive intake of fresh air is claimed to be assured for buildings with inadequate ventilation or with a "negative head" of interior air pressure due to high volume exhausting by the Type SRQ Power Roof Ventilators. They reverse conventional ventilating procedure and blow air in, instead of out. Manufacturer says they provide high air moving efficiency and economical operation with almost no maintenance. They come in five sizes with low and high speed models, in capacities from 1310 to 11,880 cfm.

Economy of installation and operation are reported for these ventilators because the entire unit is shipped assembled and enclosed in an aluminum housing that

Crane plastic pipe licks acid corrosion problems for battery manufacturer

Metal pipe and fittings would last about 30 days in the battery test tanks of Globe-Union Inc., leading storage battery manufacturer. Sulphuric acid concentration would build up gradually until a destructive electrolytic action was set up with the metal piping materials.

Eighteen months ago, Crane polyethylene pipe replaced the metal pipe and fittings. Although in continuous use, recent examination of the plastic piping revealed it to be as good as new.

Use of Crane plastic piping expanding

Made of nontoxic virgin resins, Crane plastic pipe and fittings now are used to carry more than 30 chemicals and products such as beer and other beverages, acids, salt solutions, and alkalies.

Crane plastic piping is lightweight, can be easily installed by one man using simple tools, saves manhours and is not affected by freezing. It is available in standard wall and pressure-rated pipe, with working pressures up to 100 psi at 75° F.

Ask your Crane representative for a new booklet describing Crane plastic pipe and fittings.

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For more facts circle 590 on Reply Card

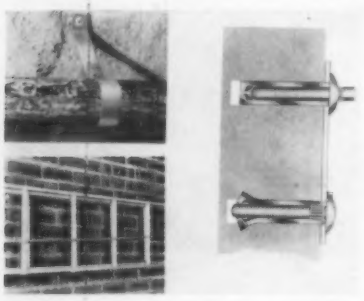
NEW PRODUCTS

(Begins on page 150)

needs no painting. Propeller fan and permanent-split capacitor type motor are directly connected. Electrical connections are mounted outside the housing for easy access, it is noted, and the motor has permanently lubricated ball bearings. The unit has a compact, low silhouette. It is available with single- and three-phase motors. Ilg Electric Ventilating Co.

8—MASONRY ANCHOR for quick, easy fastening

Faster, more convenient fastening is claimed for the Pin-Grip—by driving the pin protruding from the head flush with the head, a permanent, tight fastening job will result. To install, you use a



suitable masonry bit or drill and hammer to drill a hole in the masonry the diameter of the Pin-Grip. Insert this fastener through the fixture into the masonry hole. Then drive the pin flush with the anchor head, using an ordinary hammer. The stainless steel pin, nested in the bored aluminum body of the Pin-Grip, forces out four expanding prongs which grip the wall within the masonry hole. This fastener is suggested for securing clamps, electric cable straps, utility and junction boxes, and other equipment to masonry. A wide range of sizes is available. Star Expansion Central, Inc.

9—INSULATION made of flexible, foamed plastic

Armaflex Sheet Insulation adapts itself to curved or irregular surfaces with little or no fitting or cutting, it is announced. It is formed from the same basic material as company's Armaflex Pipe Covering. Flexibility of the new sheet form Armaflex suggests its use in insulating large tanks, irregularly shaped vessels, oversize pipes and refrigeration and air-conditioning equipment. The material withstands temperatures to 160 F, with no limitation at the low end of the temperature scale, says company, since thicknesses can be built up by applying successive layers.

Armaflex sheets are reported to have a K factor of 0.28 at 75 F mean temperature and a water vapor permeability of 0.1 perm. They come in thicknesses from ⅛ to ¾ in. in 30-by-36-in. sheets, and are applied with an adhesive supplied by manufacturer. No vapor barrier is necessary, but company recommends that outdoor installations be protected by a suitable coating. Armstrong Cork Co.

10—GREASE resists washing action of solvents

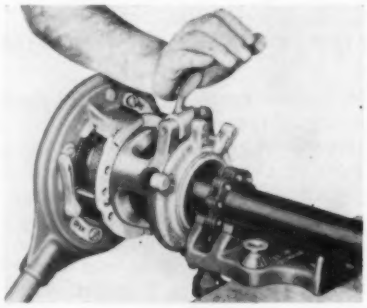
This grease has been developed to overcome the problem of lubricating pumps or other equipment used in handling solvents. It is said to be impervious to washing action of almost all petroleum and chlorinated solvents. According to manufacturer, this solvent resistant grease is not affected by naphtha, kerosene, gasoline, LP gas, fuel oils, coal tar solvents, trichlorethylene, perchlorethylene, and orthodichlorobenzene. Another feature claimed for it is that its consistency remains relatively unchanged in use and it may be pumped readily in a hand grease gun at low temperatures. Pennsylvania Refining Co.

11—PUMP UNITS handle the heavy fuel oils

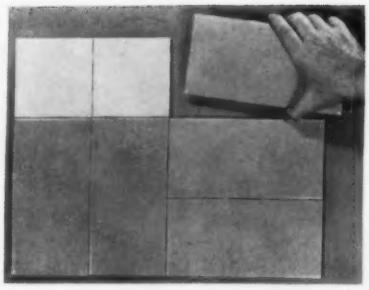
Type SU Pump Units are designed primarily for handling heavy fuel oils in industrial and other burner service. They may also be used for any non-corrosive, highly viscous liquid with lubricating qualities. Company says they have a simplified design in which lighter weight construction is achieved without sacrifice or durability. Units are provided for two or four V-belt drives, for pressures to 300 psi, and in capacities to 2030 gph. Tuthill Pump Co.

12—WORKHOLDER helps provide straight pipe threads

The TC (true-centering) Workholder assures pipe threads which are always straight and true, according to manufacturer. An improvement on company's new Ridgid 65 Pipe Threaders, this workholder can also be put on previous models. With it, there is a perfect thread



every time, it is explained, because all three workholder jaws close at one time —even if pipe is over or under size. You simply pre-set the workholder cam plate to desired pipe size, which adjusts the three jaws in a single mechanical action. When the threader is on the pipe, the jaws tighten as this three-jaw action is continued by pump of palm of the hand on cam lever. There's an adjustment for drip threads. The Ridge Tool Co.



13—WALL TILE UNIT offers design, cost features

Glazed wall tile in a new 8½-by-4¼ in. size affords greater design freedom without sacrificing any of the original advantages of ceramic tile. This new unit may be set horizontally or vertically and members readily with other standard wall tile sizes, 4¼-by-4¼ in. and 6-by-4¼ in.; it is the regular 5/16-in. thickness. When used horizontally for scale effects, this new size is particularly suitable for large wall areas, such as corridors. Used alone or in combination with other sizes and colors, it offers a means of accenting pleasing proportions, particularly in areas with low ceilings and narrow widths. Substantial savings can also be expected, manufacturer notes, since the larger unit results in lower installation costs. It is offered in 50 colors and accompanied by line of trim shapes. Folder 900 shows installations. American-Olean Tile Co.

14—CASTER maintains load rating of the wheel

Designed to maintain the maximum load rating of the wheel, this caster has a lip-type Neoprene seal which serves to seal both swivel races and wheel bearings against dirt, grit, water, acids and other contaminants. It is available in industrial and institutional models with steel, plastic, V-groove and rubber wheels. Manufacturer points out that the design of the wheel bearing seals permits full length rollers and consequent full ratings on all types of wheels. These casters are reported particularly applicable in food processing plants, chemical plants, and other areas in which rust is produced by action of chemicals, detergents or steam sprays. Colson Corp.

15—RECORDER is two-in-one measuring instrument

For comparative measurement, the Model 6791 Type 1 Recorder is actually two independent instruments in one, housed in a case only 17¾ in. wide to fit standard relay racks. It features simplified, unitized construction. The new instrument employs two plug-in type amplifiers, and two separate measuring circuits with replaceable range standards for quick range change on either one or both zones as desired. Quick-setting alarm switches are available for each zone. Slidewires are interchangeable, and totally enclosed. Chart speeds are available from 1 in. per

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RW-1

RC-15

And if you're now using 1000-watt Mercury Lamps, try the new *half*-phosphored G-E 1000-watt Mercury Reflector Lamps (either RC-15 or RC-12). All lamps are interchangeable with comparable clear lamps.

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NEW PRODUCTS

(Begins on page 150)

hour to 1 in. per minute. The instrument may be had with semi- or fully automatic standardization on potentiometer. Weston Electrical Instrument Corp.

16—PHOTOCOPIER makes copies fast, at low cost

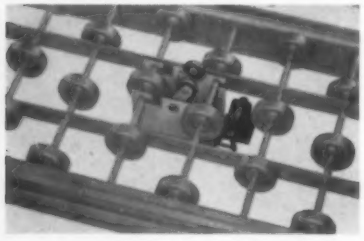
Eskophot El Combi 55 is a versatile Danish automatic photocopier designed to make copies of anything printed, written, typed or drawn, single or double sided, in a single transfer, printing, developing and fixing operation—in less than a minute—ready for immediate use. Copies are claimed to be clear and distinct in every detail and recognized as legal proofs. Operation is simple, company states, and the cost of copies is just a few pennies each. Two units are available, one for handling paper widths up to 9 in. by any length, and one for paper widths to 14 in., any length. U. S. Commercial & Distribution Corp.

17—SUCTION GUN, low in cost, large capacity

Designed for good performance at low cost, this gun will service gear cases, power transmissions, and many other components, or can be used for transferring any fluid lubricant. A flexible Linpak follower is fitted to the barrel and is impervious to lubricants. Even when filled to maximum 18-oz capacity with nozzle held downward, lubricant will not leak out of gun, says manufacturer. Of all steel construction with rust resistant finish, gun is supplied with non-drip nozzle and flexible tube. Details are in Bulletin 223. Lincoln Engineering Co.

18—AUTOMATIC CASE COUNTER for conveyor lines

An accurate traffic count on wheel conveyor lines is reported possible with this automatic case counter which carries



totals to 99,999. Easy installation of counter without tools or alteration of wheel pattern, company notes, makes it possible to have an accurate count on several lines by switching from line to line as necessary. Counter can be positioned for flow counting in either direction and hooks quickly over axles of a conveyor line when flow direction is changed. The Rapids-Standard Co., Inc.

19—STEEL BINS offer storing, and shipping benefits

Deltainers are portable steel bins for storage and shipping of granular or powdered materials. They cut packaging and storage costs and provide an economical method of in-plant transportation, says company, and when shipped by truck or on specially designed freight cars, these bins are considered part of the carrying vehicle and thus qualified for transportation without freight charges on the bins. Both shipper and receiver of Deltainer shipments can readily demount and transport individual bins within their plants with conventional pallet trucks, fork lift trucks or overhead cranes. The bins are emptied through barrel-lid center openings by inverting.

Deltainers come in 36-, 65- and 88-cu ft sizes, all rated for 5000-lb capacities. They are produced by Delta Tank Mfg. Co., Inc., developed in conjunction with Chemical Divisions of Food Machinery and Chemical Corp., and used as a basic part of the latter's Uni-Hopper System. Designed for transit aboard rail flat cars or highway truck trailers, 28 Deltainers will fit — two abreast — on special cars leased by Shippers' Car Line Div. of ACF Industries, Inc. Ten units fit aboard the average truck trailer bed. Delta Tank Mfg. Co., Inc.

20—PLUG-IN UNITS speed thermocouple connections

The Quick-Konnect line of plug-in thermocouple components is designed to simplify and speed-up connection of thermocouples to industrial instruments. The connecting units (a series of plugs, jacks, multiple jack panels and such related hardware as cable clamps and tube connectors) can be used for either single or multiple thermocouple connections. The "contact inserts" are made of compensating materials suitable for use with thermocouple types, J, E, T, S and R. One contact is always slightly larger than the other to prevent improperly polarized connections. Industrial Div., Minneapolis-Honeywell Regulator Co.

21—AIR LINE FILTERS offer design improvements

Series 30AE Filters are claimed to improve operating efficiency, reduce maintenance costs and increase life of air operated equipment. According to manufacturer, moisture removal efficiency has been stepped up and pressure drop has been further reduced. Hinged-type louver plates which set an improved centrifugal air flow pattern, and larger filter elements help produce a higher degree of filtering efficiency. Full details on these compressed air filters are in Bulletin 565. C. A. Norgren Co.

22—METERING INSTRUMENT for large fluid flow rates

The By-Pass Rotameter is designed to permit economical measurement of large fluid flow rates in pipe sizes of 2 in. and above. It utilizes most features of company's Rotameter instruments such as: linear response, wide range (up to 10 to 1), direct reading scale, and ability to handle corrosive fluids. Overload checks, seal pots and equalizing valves are not utilized. Further details are in Bulletin 116. Brooks Rotameter Co.

23—BEAM CLAMPS can be useful in many ways

Of forged steel, these clamps for American Standard I-beams can be used in a variety of ways. They can be used to hang beams from other beams, to hang hoists from beams by employment of a clevis, and in other hanging arrangements for I-beam monorails and underhung runways. The clamp takes loads from 1,250 to 12,200 lb and its prices range from around $2.50 to $12.50. Bacon Crane and Hoist Corp.

24—HOT SULFUR PUMP has heated discharge line

For handling molten sulfur, the Type YWS-C Pump features a heated discharge line. It is pointed out that molten sulfur crystalizes or hardens at other than a critical temperature, and by jacketing the discharge pipe so that it is enveloped in steam, the liquid sulfur can be maintained at the critical temperature. The pump is a wet pit type, its impeller housing is immersed in the material being pumped. Although designed to handle sulfur, the pump is declared applicable to other materials which must be held at a critical temperature. Nagle Pumps, Inc.

25—SOLDERING IRON for many sheet metal jobs

The Prest-O-Lite 406 Medium Soldering Iron, an air-acetylene unit, is designed to handle all but the heaviest soldering jobs in sheet metal, electrical, plumbing and plant maintenance jobs. This iron

wherever the need...
whatever the size...

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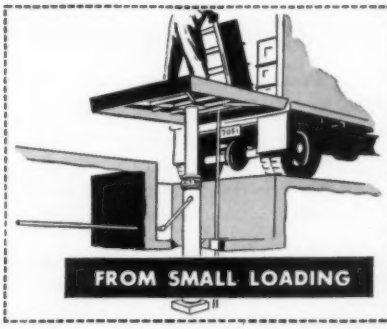
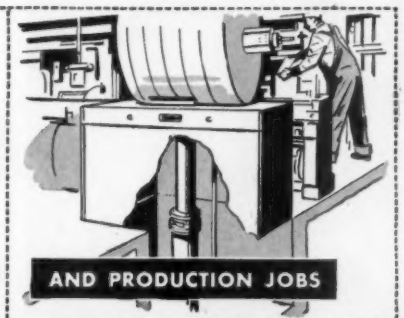
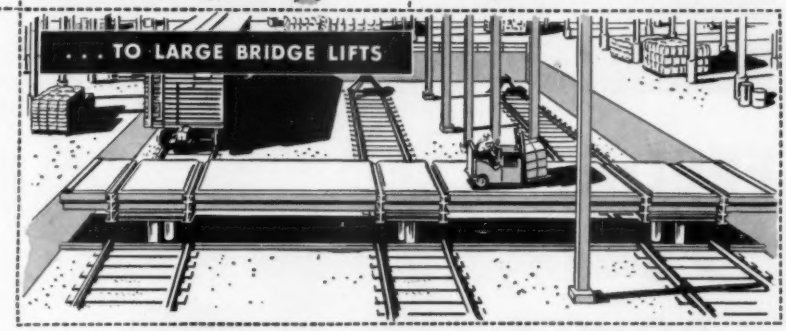




TO LOAD MACHINES
(*Left*) Globe OiLIFTS position bulky materials to speed production of machines and processes.

TO CROSS A DEPRESSED AREA
(*Below*) Synchronized hydraulic cylinders raise giant Globe bridge lifts from railroad track level to loading dock height, permitting two-lane traffic of heavily loaded fork trucks.

TO LOAD TRUCKS
(*Above*) Where no loading platforms are available, Globe OiLIFTS quickly raise heavy loads to truck bed level. In "down" position, platforms are flush with floor, permitting free cross travel of men and vehicles.



Whether the load is 1,000 lbs., or 50,000 lbs. . . . whether the lift is a few inches or 50 ft. . . . the Globe OiLIFT which does the job is assembled with standard production line components. Oil-hydraulic cylinders, platforms, power units and control systems are available . . . stress and performance tested . . . for initial low cost, early shipment and quick installation.

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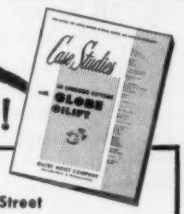

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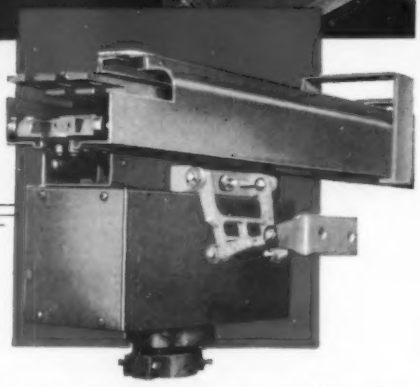

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NEW PRODUCTS

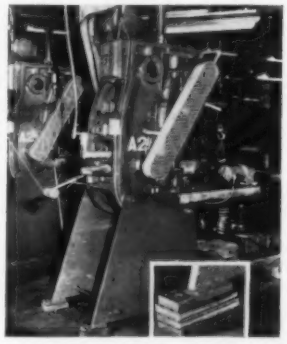
(Begins on page 150)

heats up to full working temperature in less than 2 min, says company, and it will do the work of a pair of furnace-heated 3-lb irons or an 880-w electric iron. Equipped with form-fit handle and thumb rest, the new iron is designed for ease of operation in any position. Stainless steel stem and tube-within-a-tube construction retard heat conduction to handle. A needle valve at the rear of the handle provides for flame adjustment. Linde Air Products Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 205-206.

26—MOUNTING PADS absorb punch press vibration

Designed specifically for punch presses, the new Air-Loc 4-17-1 Mounting Pads (called Giant Grip Air-Loc) are designed



to absorb about 15 per cent more transmitted vibration than the original Air-Loc 4-17-4. No bolts or cement are used in the punch press installation pictured. The inset shows a closeup of a foot of the press installed on three pieces of the vibration absorbing material. Clark, Cutler, McDermott Co.

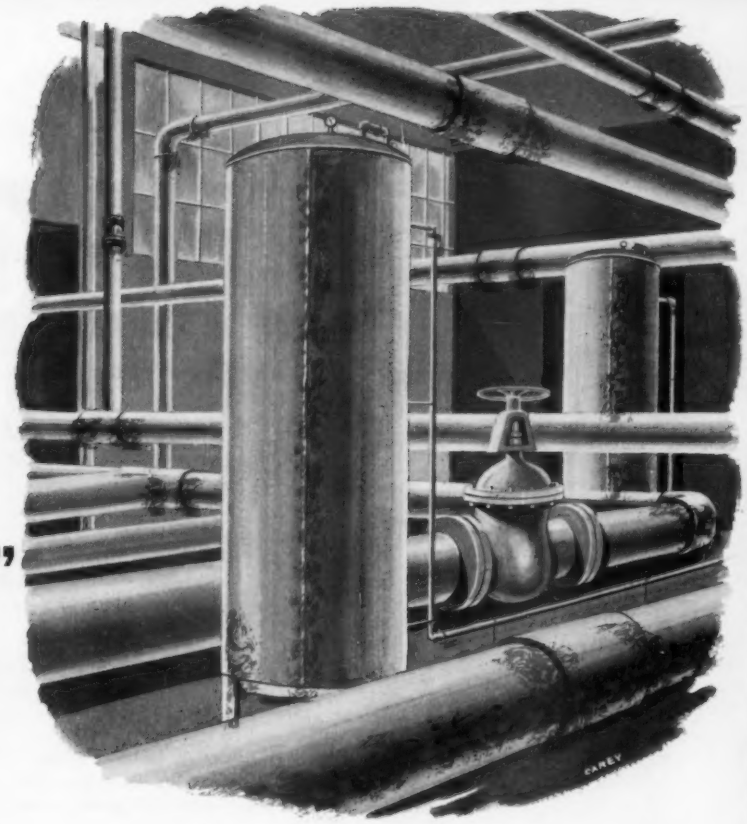
27—PLATE GLASS DOOR held under compression

The West Tension Door is announced as a ½-in. thick, plate glass door held under compression by a thin metal frame to provide a durable non-sagging unit. Concealed bolts draw the narrow aluminum door frame together as compression is applied by means of pads and heavy steel leaf springs in the lower grazing channel, thus putting the stiles into tension. So mounted, the glass is said to have exceptional impact resistance, thereby reducing possibility of breakage. According to company, this door is particularly suitable for operation with automatic opening devices.

The new door comes in rough or

Protective coating failures usually begin with

"TROUBLE SPOTS"



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COPON coatings provide superior protection for seams, welds, sharp edges and other corrosion "trouble spots." They provide higher film build-up per coat and cling tenaciously to metals and alloys. They last longer, because Copon remains tough and elastic even when subjected to chemical fumes, heat and high humidity. And they are less likely to be mechanically damaged, because Copon offers greater abrasion resistance than most protective coatings.

Easily applied by brushing or spraying, there is a selection of Copon coatings designed to solve or prevent severe corrosion problems. They have been used successfully to protect offshore drilling rigs, internally coat new and used pipelines, stop corrosion losses in chemical plants and paper mills, and in many other installations where corrosion costs were skyrocketing.

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2 Unique outboard bearing design prevents platform tipping. This means that you get *completely* accurate weighing on any part of the scale.

3 DETECTO's tare and weigh beams extend the dial capacity 125%. This means that you get greater gross weighing with minimum dial graduations.

Fractional weighing errors may *seem* inconsequential, but they add up to a staggering annual loss. When materials mean money, you are wise to depend on DETECTO, the most dependable name in precision industrial scales for more than half a century.

DETECTO makes scales for every industrial need, ranging from 1/100 oz. to 50 tons. Models for packaging, parcel post, printing, counting, over-under attachment, portable beam, etc. Write for free, no-obligation catalog.

SALES and SERVICE in all principal cities

Fine Scales Since 1900

DETECTO SCALES INC.

505 Park Avenue, Brooklyn 5, N. Y.

Detecto Scales, Inc.
522 Park Avenue, Brooklyn 5, N. Y.

Gentlemen:

Please send me catalog #651 describing DETECTO precision industrial scales. This, of course, obligates me in no way.

Name.....

COMPANY.....

City.....Zone.....State.....

For more facts circle 595 on Reply Card

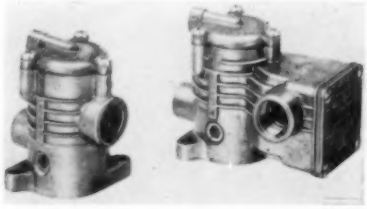
NEW PRODUCTS

(Begins on page 150)

polished plate glass and offers unusual design possibilities. Locks and accessories are interchangeable. Where complete open vision in entrances is desired, handles can be applied directly to the glass with locks in top or bottom rails. Many combinations of pull or push plate type door handles are available, all of anodized aluminum finish to match the metal material of the doors. Push plate type handles can be had in standard Carrara and Spandrelite colors. Manufacturer of this door says it is moderately priced. Pittsburgh Plate Glass Co.

28—CONTROL VALVES offer accuracy, quick response

Small solenoid pilot valves for handling air, vacuum, oil, water and inert gases, are designed for control of company's Speed King remote pilot operated valves or direct control of small cylinders and similar devices. Available in two- and three-way types, these valves are declared applicable in laboratories and on precision



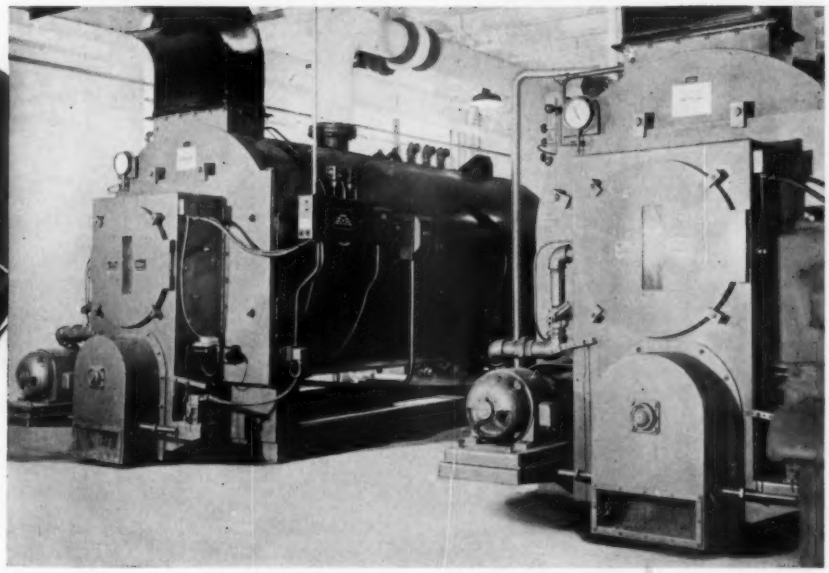
production equipment where accurate control and quick response are required. Capacities range up to 23.8 cfm air and 3.8 gpm hydraulic. Valves are reported capable of controlling over 600 cycles per minute.

The solenoid enclosure is dust and moisture proof, manufacturer points out, and sealed to keep out splashing liquids and airborne contamination. Both plunger and spring—only moving parts—are stainless steel. Hycar seats and O-ring seals resist oxidation and abrasive wear. Air passing around the plunger serves to clean and lubricate it and cool the coil. The valves can be had with or without junction box. Cylinder ports are tapped ¼ in. NPT, and electrical conduit connections, ½ in. NPT. Valves can be supplied for direct pipe connection, with sub-base or drilled for manifold mounting. Bulletin PB gives details. Valvair Corp.

29—CABINET FAN offers versatility, space savings

Designed for operation at low noise level and space-saving installation in buildings with low ceilings, this large volume unit, the Cabinet Fan, is suggested for industrial and commercial applications. It can be used in air moving systems for supply, exhaust, or recirculation of air, and is available in 12 sizes from 600 to 34,500 cfm, with outlet velocities from

"No engineer likes a gamble. That's why I want the UNFAILING DEPENDABILITY of Packaged Boilers"



Two 175-HP Gas-Fired Continental Automatic Boilers, installed at Tri-County Joint School District, Canton, Pa.

"As an engineer, I can't afford to take a chance. So when we design a modern heating plant, I make certain we get dependability. In fact, that's why I insist on Packaged Boilers.

"Heating, power and process requirements are always of vital importance. That's why two Packaged Boilers, each designed to carry 75% of the maximum demand, may very well be a better buy than one built-up firebox type of boiler. Sure, that's conservative designing. But it pays off in winter-long reliability, no matter what the weather.

"Later, if new buildings are added or there's some other need for increased steam production, it's easy and economical to install another Packaged Boiler. So we not only get dependability, but flexibility, too. That kind of a package makes everybody happy."

Six Reasons Why it Pays to Buy a CONTINENTAL Automatic Boiler

* Guaranteed 80% efficiency . . . Fire-tested before shipment . . . Range, 20 to 500 hp.
* Simple, practical two-pass design, for uniform flow of combustion gases through all return tubes.
* Maximum radiant heat transfer achieved by "Spinning Gas" technique for thorough mixing of air and atomized fuel.
* High-CO_2 and low-temperature stack gases — proof of high combustion efficiency.
* Free, rapid water circulation improves heat transfer, keeps heating surfaces clean.
* Easy access to furnace and all return tubes. Refractory baffles and brickwork are not required.

For details on the Continental Automatic Boiler, send for Bulletin BE-3

BOILER ENGINEERING & SUPPLY COMPANY, INC.

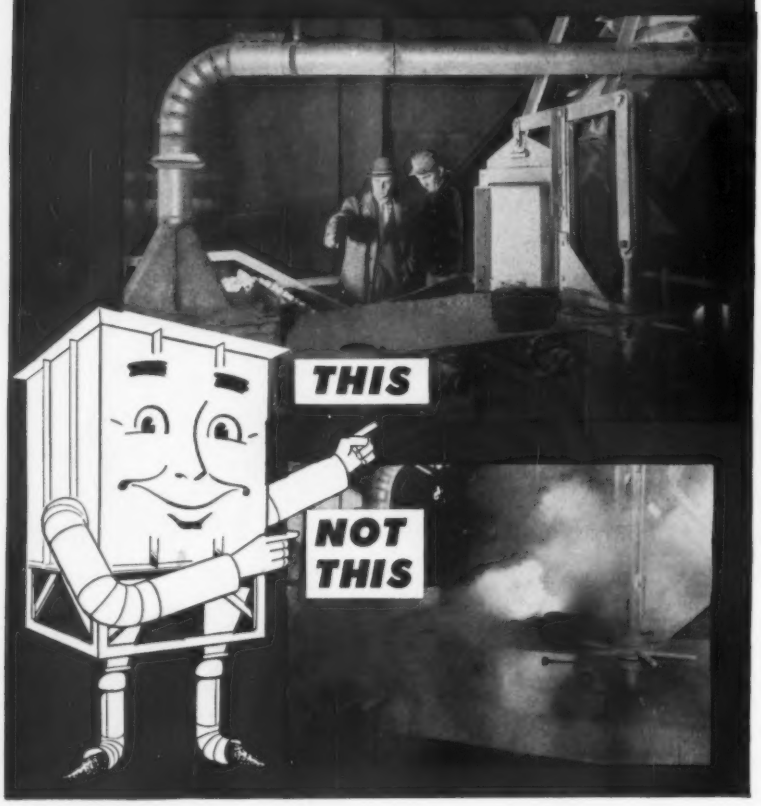
2 Manavon Street, Phoenixville, Pa.

A HALF CENTURY OF BOILER MANUFACTURING EXPERIENCE

The Continental AUTOMATIC BOILER

For more facts circle 596 on Reply Card

Dust Cutting Down Machinery Life?



You need Pangborn DUST Control in your plant!

Uncontrolled dust in your plant is a costly, needless expense. Dust wears away delicate machinery and clogs working parts, increases down-time and repair costs.

Pangborn Dust Control stops that. Pangborn Collectors trap dust at the source, clean so thoroughly that in the winter many firms cut heating costs by recirculating the already-heated, cleaned air.

In addition, Pangborn gives you the bonus benefits of lower housekeeping costs, more efficient employees, better employee and community relations and extra profits from any salvage value. Complete line of collectors for all jobs.

Discover how *you* can profit from Pangborn Dust Control—write for Bulletin 922, PANGBORN CORP., 3200 Pangborn Blvd., Hagerstown, Md.

11 D

Pangborn CONTROLS DUST

For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 150)

1000 to 2600 fpm. One- and two-fan models are available, with two-fan units mounted side-by-side on a single shaft to maintain a flat, compact cabinet. Bearings, drives and motor are mounted outside the cabinet. Optical equipment for the Cabinet Fan includes filters, mixing box and dampers. Further information is in Bulletin DS-348D. The Trane Co.

30—PARTITIONS offer installation advantages

Features of Budgex Partitions include a sound-retarding core of acoustical spun glass, flush surfaces and baked enamel finish, according to manufacturer, and

they are competitively priced. They come in three heights: 42-in. flush; 42-in. plus 12-in. glass; and 42-in. plus 24-in. glass. A variety of lengths and standard eye-ease colors are available. An advantage of these partitions is that they can be sawed off—on the job—to desired length. Budgex Partitions are reported easy to install—they can be locked together with a screw driver. Rubber-footed legs are adjustable. G R Products, Inc.

31—AIR RELEASE VALVES have bronze valve and seat

These heavy duty air release valves (air traps or air vents) are automatic and continuous in operation, manufacturer states, and release air as fast as it accumulates. They are normally installed at high points of a piping system where air pockets naturally form. Of heavy duty construction, the valves have body and head of cast iron metal. Inside is a copper float which actuates a valve and seat made of heavy duty bronze.

In operation, air enters bottom inlet of air release valve which is connected to the piping system. This air bypasses the valve and seat escaping to the atmosphere through vent at top of valve. When the system contains no air, the liquid passes through the inlet, raises the float which, in turn, actuates a valve through a lever. This closes the valve against the seat at vent opening. Additional air or gas in the system lowers liquid level, causes float to drop, opening valve, and releasing the air or gas.

Applications of these valves included water mains, oil lines, brine lines, water

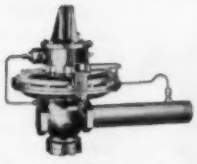
METER YOUR INDIVIDUAL FURNACES TO CONTROL QUALITY AND COSTS

When you process with gas, metered records of consumption will quickly show up combustion deficiencies that affect the quality of your end product. Meters standing guard at every burner will discourage wasteful fuel practices. And only from metered records of the fuel used can you arrive at accurate costs.

Why don't you investigate the advantages of metering individual furnaces, kilns or ovens? Learn the economies of using Rockwell meters as production tools. *Write us or use the handy coupon.*

Good Combustion Requires Close Regulation

For Low Pressure Burners



For High Pressure Burners

Good combustion control is the key to good process control. Rockwell makes a complete line of pressure regulators for all types of industrial burners. Use the coupon for full details.

ROCKWELL
GAS METERS
and REGULATORS

CLIP COUPON—MAIL TODAY

Rockwell Manufacturing Company
Pittsburgh 8, Pa.

Gentlemen:
I am interested in your meters for measuring gas to individual furnaces ☐. Your pressure regulators for burner control ☐. Please send literature ☐. Have representative call ☐.

Your Name_____

Company_____

Street_____

City_____ Zone_____ State_____

For more facts circle 598 on Reply Card

Ruggedly Safe

—to do any jacking job better!

SIMPLEX JACKS

Re-Mo-Trol HYDRAULIC PULLERS

(PUMPS AND REMOTE CONTROLLED RAMS)
10 to 100 ton capacities

UNIQUE "CENTER-HOLE"* minimizes rigging and set-up—provides more effective power.

Simplifies tough pulling jobs! Pull rod or screw is drawn *through* ram plunger in straight, torque-free pull. Ram is own backup. Also lifts or presses.

***"Center-Hole" in rams of 30 ton and greater capacities.**

RATCHET LOWERING JACKS

Lift or lower the load notch by notch. Cannot be tripped. *Toe* has *same capacity* as cap! High lift with minimum clearance means less set-up, less blocking. Single or double acting. 1½ to 20 ton capacities.

HYDRAULIC JACKS

Fast, easy power! Operate vertically or horizontally with same efficiency. Tested to 50% over rated capacity. Single or double pump models; 3 to 100 ton capacities.

SCREW JACKS

Cap floating on single chrome-moly ball reduces friction 88%. Forged cap corrugated for safety. Malleable iron base flared for stability. Four-way or ratchet heads. 10 to 24 ton capacities.

Other SIMPLEX JACKS include:

Simplex-Jenny Hydraulic Pullers
Push and Pull Jacks and Accessories
Reel or Drum Jacks
Trench Braces
Timber Braces

WRITE FOR GENERAL CATALOG No. 56

Simplex
LEVER · SCREW · HYDRAULIC
Jacks

TEMPLETON, KENLY & CO. 2561 GARDNER ROAD, BROADVIEW, ILL.

For more facts circle 599 on Reply Card

NEW PRODUCTS

(Begins on page 150)

filters to release air restricting the flow of the liquid; hot water heating systems; chilled water conditioning systems where air retards circulation and cuts cooling. The valves come in three types: Type No. 70 in ½-in. size for pressures to 125 psi; Type 72, ½- and ¾-in. sizes, for 250 psi; Type 73, 1- to 1½-in. sizes, for 250 psi. Complete information is in Bulletin 856. The V. D. Anderson Co.

32—PRESSURE CLEANER has several cleaning actions

Instant choice of many types of cleaning action is a prime feature announced for the Series 4000 Hypressure Jenny. By simply setting valves on the control panel, you can get any desired cleaning action ranging from 400 gph of clear cold

water at 450 lb pressure, to a mixture of steam, water and cleaning compound at 325 F, company states. Many combinations of heat, pressure and water volume, with or without cleaning compound, enable the unit to perform such jobs as removing grease and dirt from machinery, parts and floors, cleaning for repainting, sanitizing or deodorizing. The cleaner comes in portable or stationary models with electric motor or gasoline engine driven pumps and a choice of oil or gas for fuel. Bulletin 17-A-56 gives specifications. Homestead Valve Mfg. Co.

33—DIGITAL COUNTER is transistorized unit

Announced as featuring reliability in small size is a transistorized digital counter which, when teamed with appropriate conversion equipment, counts articles distance, degrees of rotation, or angular measurements—at high speeds. According to manufacturer, this counter's dependable operation is due to use of transistors, and its small size and moderate cost to use of printed circuit boards and modular construction. Total power consumption is 2 w, it is noted, and the unit is conservatively designed, with transistors operating well below their maximum rating. Counting frequency is 15,000 cycles per second. The counter can be preset anywhere from 1 to 500.

In operation, the output of a suitable transducer is sent to transistorized flip-flops within the counter. These, in turn,

IT THINKS with a difference that means extra protection!

ECON-ALLOY makes the Difference!
When current overload is continued beyond the safe and pre-determined time, exclusive Econ-Alloy breaks the circuit by changing directly from solid to liquid. The usual plastic stage is eliminated, insuring faster, more accurate protection against overloads and shorts.
Cut Fuse Costs
End Needless Fuse Blows
Eliminate Down Time
* Fast Short Circuit Protection

With the exclusive, *different* Econ-Alloy thermo element acting as the "brain" of the ECON Dual-Element Fuse, you get *double* protection: accurate, "timed" protection against overloads (up to 500%)—and *instant* breaking action on shorts.

Economy Dual-Element Fuses are specially engineered for motor, branch and feeder circuits—save time and money where you have frequent power surges, or the risk of high fluctuation in load.

Available in knife and ferrule types: 0 to 600 amperes; 250 and 600 volts. Approved by Underwriters' Laboratories, Inc.

ECON® DUAL-ELEMENT cartridge fuses

Write for ECON Dual-Element Catalog S-60 . . . or literature on all Economy Fuses.

ECONOMY FUSES FOR EVERY PURPOSE

1459

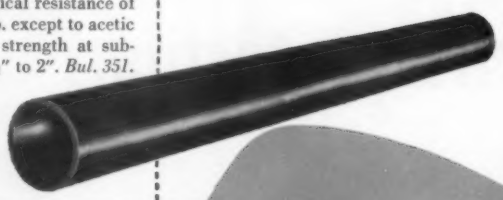
Order ECON Dual-Element and other Economy Fuses directly from your ELECTRICAL WHOLESALER

ECONOMY FUSE & MFG. CO., 2717 Greenview Avenue, Chicago 14, Illinois

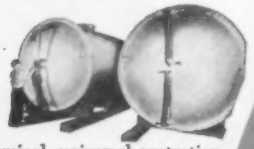
For more facts circle 600 on Reply Card

STAYS TOUGH
AT SUB-ZERO TEMPERATURES

ACE PARIAN . . . odorless, tasteless, rigid polyethylene. Best chemical resistance of any plastic at room temp. except to acetic acid. Excellent impact strength at sub-zero temp. Rigid pipe ½" to 2". *Bul. 351.*



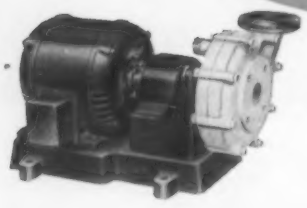
LIFE-TIME
ACID STORAGE TANKS
Rubber-lined by ACE
2-layer system



Economical, universal protection against all alkalis, metallic salts, practically all inorganic acids, hydrochloric acid any strength, sulphuric to 50%, nitric to 20%, phosphoric to 75%. Good to 160 deg. F. . . . sometimes higher. Soft rubber interlayer aids shock resistance.

Now eleven ACE Materials to STOP CORROSION

Eleven job-proved rubber and plastic materials now available in ACE piping, valves, pumps and tanks. Tough Ace-lite rubber-plastic blend . . . Saran . . . heat-resistant Tempron . . . Riviclor PVC . . . many others. Write for comparative properties Bulletin CE-50 . . . or call your American Hard Rubber Company distributor.



ACE "WAM" . . . THE FINEST
Non-metallic Acid Pump

On job after job, this 80-gpm. centrifugal pump has earned highest praise. Hard rubber casing and impeller, Hastelloy C shaft. Handles nearly all corrosives. Mechanically simple, trouble-free. *Bulletin CE-55.* Larger ACE pumps available.

NEED SPECIAL FITTINGS,
COVERS, TANKS, PARTS?

If you want life-time corrosion protection for special parts needed in quantity . . . we may save for you by molding them of ACE hard rubber or plastics to your most exacting requirements. Our facilities among world's largest. Ask for recommendations.

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
93 WORTH STREET • NEW YORK 13, N. Y.

For more facts circle 601 on Reply Card

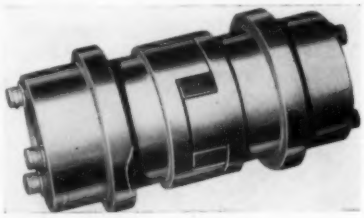
NEW PRODUCTS

(Begins on page 150)

when the desired number is reached, cause an output relay to function. The unit is 4 in. high, 11⅝ in. wide and 9⅛ in. deep. Its selling price, below $400, includes counsel on how to use the counter and help on engineering it into a system. Nader Mfg. Co.

34—FLEXIBLE COUPLING is radially removable unit

The Type RRL is described as a radially removable coupling providing a simple means of disconnecting two units without axial movement of shafts. This coupling is reported to simplify maintenance and be ideal for applications



where driven equipment, such as a pump, must be disconnected while the driving unit continues to operate. All that is claimed necessary in such cases is to disassemble the coupling itself. Manufacturer says the coupling is rugged and simple in design, and because the load is transmitted by compression of the one-piece load cushion, there is no wear on the metal jaws. Ratings range from 7.5 to 40 hp at 1800 rpm; bores are from 1⅜ to 2¼ in.; outer diameters from 2⅞ to 5 in.; overall length, from 6⅛ to 7⅝ in. Lovejoy Flexible Coupling Co.

Use the Reader Service Cards provided on pages 205-206 to ask for more information on these products. Circle item numbers of products in which you are interested.

35—SAFETY SWITCH needs less installation space

The 30-amp, 600-v Style HCI Safety Switch is reported to use 50 per cent less installation space than formerly required. Utilizing compact design, device is only 7⅜ in. wide by 9⅜ in. high by 5⅛ in. deep. It is available in both heavy and normal duty models, and in oiltight NEMA Type 12 enclosures for industrial applications. A front-operated handle on heavy duty model makes close ganging easy. The double-break HCI pole units can be individually replaced, and front fusing on both models allows quick access to fuses. The switch has quick-

Another Feature of the FW Series "SC" Standard Boiler

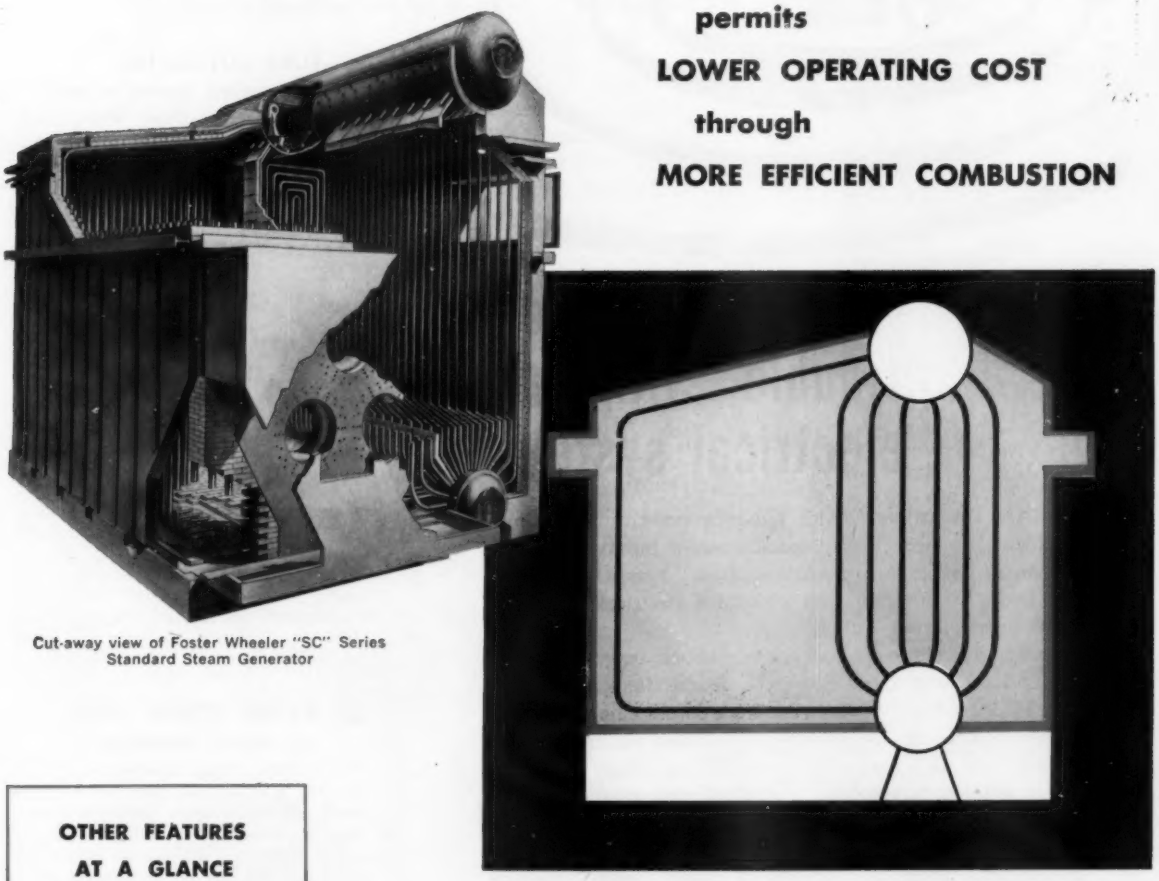
PRESSURE-TIGHT CASING

permits

LOWER OPERATING COST

through

MORE EFFICIENT COMBUSTION



Cut-away view of Foster Wheeler "SC" Series Standard Steam Generator

OTHER FEATURES AT A GLANCE

- Completely water-cooled walls
- Over 19-foot firing depth
- Unrestricted circulation
- Fully drainable superheater
- Efficient convection surface
- Bottom supported unit
- Steam purifying system
- Full insulation

THE ALL-WELDED steel casing of the Foster Wheeler Series "SC" Steam Generator forms a rigid, pressure-tight unit which can be arranged for either pressurized or balanced-draft operation.

By eliminating all possible sources of air or gas leakage, this pressure-tight design increases combustion efficiency and contributes to higher fuel economy per pound of steam per hour. No sliding seals are necessary as the stationary casing is welded to the drums and the differential in expansion provided for by an integral horizontal expansion joint which encircles the entire unit. Pressure-tight ports are provided for observation of burners and flame.

These cost-saving FW Series "SC" Steam Generators are available in capacities from 50,000 to 150,000 lb/hr, for pressures to 1500 psi and superheated steam temperatures to 950F. For further information, write for Bulletin B-55-4. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

For more facts circle 602 on Reply Card

HEAT

. . . may be the "trouble" with your electrical system

Are you troubled with nuisance power interruptions, insufficient branch circuit capacity, motor burnouts and the accompanying costly production delays? You will probably find that *heat* affecting your protective electrical equipment is the heart of your trouble.

You can eliminate heat considerations, however, simply by replacing with HEINEMANN Circuit Breakers.

HEINEMANN Circuit Breakers do not employ thermal elements or heaters of any type. Thus, their current carrying capacity and all set tripping points are completely independent of ambient temperature . . . unaffected even by nearby furnaces, steam pipes or cold drafts. HEINEMANN Circuit Breakers do not require de-rating. With HEINEMANN, 20 amperes means 20 amperes of usable capacity without needless tripping.

HEINEMANN Circuit Breakers operate on a hydraulic-magnetic principle. They provide inverse time delay to allow starting inrush or harmless, temporary overloads . . . yet they provide the fastest circuit interruption available on large overloads or short circuits.

GET THE COMPLETE FACTS: Send for your copy of "WHAT YOU SHOULD KNOW ABOUT CIRCUIT BREAKERS". Ask for Manual 101.

HEINEMANN ELECTRIC COMPANY
128 Plum Street • Trenton 2, New Jersey

HEINEMANN Circuit breakers

For more facts circle 603 on Reply Card

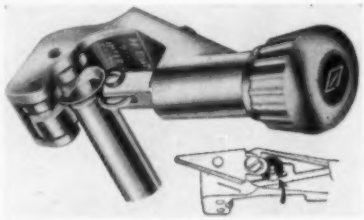
NEW PRODUCTS

(Begins on page 150)

make, quick-break contacts which can't be teased in or out, it is noted, and the handle locks off or on. A special line shield on heavy duty model serves to guard against accidental contact with live parts. General Electric Co.

36—TUBE CUTTER has concealed spare wheel

For use with copper, steel or aluminum tubing from ⅛- to 1-in. OD, the Hi-Duty Tube Cutter includes a spare cutting wheel concealed in a recess behind the reamer. This wheel remains out of the



way until needed, it is pointed out, but is on hand for emergencies. Features announced for the cutter include free wheeling ball bearing action, retractable reamer, flare cut-off groove for removing damaged flares with a minimum of waste, and concealed feed mechanism. Tubing revolves against two rollers to make operation easy. Bulletin 3057 gives details. The Imperial Brass Mfg. Co.

37—PAPER TOWEL takes up more moisture

UHA (Ultra High Absorbency) Towel No. 151 is a C-Fold type incorporating many improvements in absorbency, softness, appearance and efficiency. It replaces company's well-known ScotTissue C-Fold No. 15 at no increase in price. Most noticeable feature of the new towel is its contoured surface appearance which resembles fine cloth. An embossing process produces the stippled surface and is the secret of the towel's high absorbency. This manufacturing operation produces greater porosity, bulk and thickness, it is noted, and these result in a more comfortable "feel." The new towel measures $10\frac{7}{8}$ by 14 in. and is packaged 150 to a board sleeve. The towels fit in C-Fold cabinets already in use or new cabinets can be had. Scott Paper Co.

38—OIL BURNER is economical, and efficient unit

Econol TH-60 and TH-84 Oil Burners are designed to give higher efficiency from low-cost No. 5 fuel. No. 1, 2 and 4 oils may also be burned. A 2,000-w preheater heats oil to burning temperature. Other features are: iris shutter to provide accurate, metered air control, a built-in viscosity compensator to as-

Inside Story on POWELL

PRESSURE SEAL VALVES

Pressure seal valves may appear similar on the outside. However, the Powell Pressure Seal Valves are quite different in design and in manufacture. And the inside story on Powell Pressure Seal Valves is that every valve has PERFORMANCE VERIFIED.

Only the finest materials are used in Powell Pressure Seal Valves, and painstaking quality control is rigidly enforced through each step of manufacture. For example, every machining operation is accurately gauged. All parts are thoroughly cleaned and degreased and thoroughly inspected.

Because of Powell's painstaking quality control, plant shutdown through valve failure is practically unknown. Records from power and industrial plants the world over prove it.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our COMPLETE quality line which has PERFORMANCE VERIFIED.

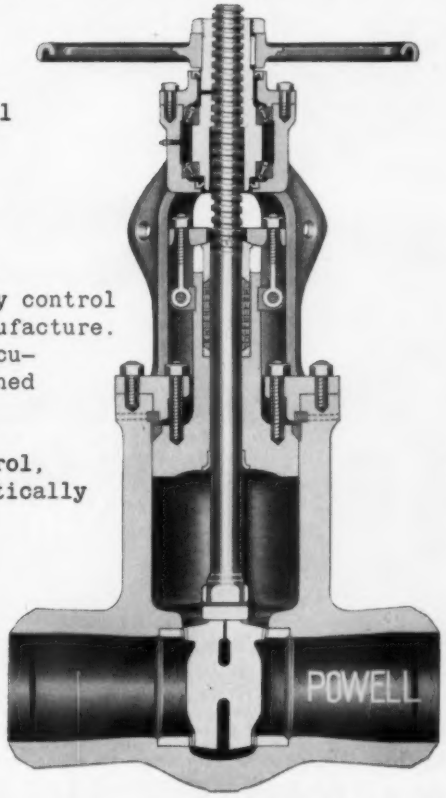


FIG. 11303 — (Sectional) 1500-Pound Pressure Seal Steel Gate Valve

Fig. 1314-A — 1500 Pound Integral Bonnet Steel "Y" Valve.

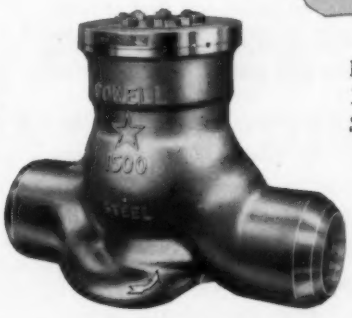


FIG. 11365 — 1500-Pound Pressure Seal Piston Guided Horizontal Lift Check Valve

PERFORMANCE PV VERIFIED

The Wm. Powell Company, Cincinnati 22, Ohio . . . 111th YEAR

POWELL VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT VALVES

For more facts circle 604 on Reply Card

MARLEY DOUBLE-FLOW AQUATOWER*

SMALL INVESTMENT

protects your BIG INVESTMENT...

Air conditioning or refrigeration systems represent a large investment — yet their efficiency hinges in large part on the performance of the cooling tower. Keenly aware of this key role played by the cooling tower, engineers take care to select one that is consistent in its ability to deliver cold water at specified temperature and volume . . . at an economical price per gallon.

That is why the overwhelming majority of engineers choose the Marley Double-Flow Aquatower for water cooling on a commercial and institutional scale. It has proved its dependability of performance in far more installations than all other towers in the intermediate-capacity range. Its simplicity of design makes it more economical to install, inspect, and maintain; its efficiency makes it more economical to operate. Even its appearance is a "plus feature", for the Double-Flow Aquatower is the original low-silhouette tower that doesn't call attention to itself.

If you are contemplating an investment in air conditioning or refrigeration, it will pay you dividends to investigate the Double-Flow Aquatower. This you can easily do by calling your local Marley Application Engineer, or writing for Bulletin DFAQ.

*Trademark Reg.

MARLEY

The Marley Company

Kansas City, Missouri

For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 150)

sure a constant firing rate regardless of oil viscosity, an improved air-oil atomizing nozzle. The Econol also has a low-fire start, to assure safe ignition, without flarebacks. Compressor, fuel-oil pump and motor are located on a separate chassis, which may be installed on a wall or suspended from ceiling. Model TH-60 burns from 5 to 20 gph of oil and has a maximum boiler rating of 60 hp. Model TH-84 burns 7 to 28 gph and has boiler rating of 84 hp. Both models are equipped with a 90-gph oil pump. Industrial Div., York-Shipley, Inc.

39—ELECTRIC HOIST is two-speed type

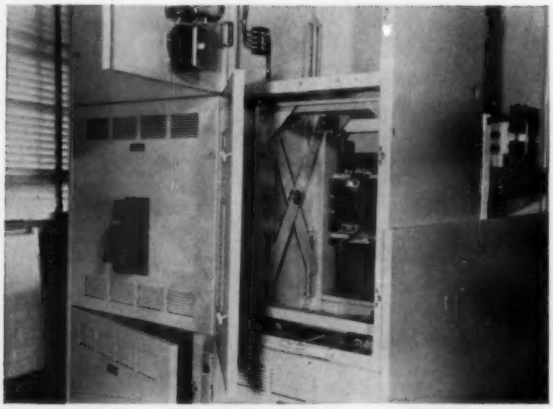
This Frame 1, two-speed Wright Speedway Electric Hoist, with fractional horsepower 1800/450 rpm motors, is designed to provide a fast lifting and lowering speed and a slow, ¼ normal speed, for gentle positioning of production work. According to manufacturer, this hoist parallels sensitivity of control of air hoists. The housing is designed so that side and end covers can be readily unscrewed for quick servicing of exposed parts. Two adjustments of a set screw are all that is required to compensate for brake lining wear, it is noted. Available in parallel mounting, cross mounting, hook mounting and rigid or bolt mounting, the hoists utilize totally enclosed NEMA specification motors for either a-c or d-c operation. Wright Hoist Div., American Chain & Cable Co., Inc.

40—PRIME COATING protects against rust

Announced as several times stronger than red lead primers, Zinktron is a zinc based paint that gives chemical as well as mechanical protection. According to manufacturer, this is accomplished by having the binding material so fine that the majority of zinc particles are in direct contact with the metal surface it is applied to—the difference in potential of the two metals giving the added protection. Zinktron requires only stirring, and is applied with brush or spray to new iron or steel surfaces or to old, rusted metal. On the latter, the loose rust is first removed and two coats of Zinktron are applied. Rust creep is claimed to be prevented by the double action protection of this coating—the top decorative coating holds without blistering. Any oil based paint may be used

SECONDARY UNIT SUBSTATIONS

ENGINEERED AT I-T-E and coordinated to meet the operating conditions found in your plant.

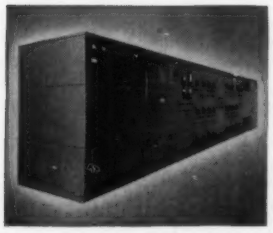


BUILT AT I-T-E with such extra features as circuit breaker test-position with doors closed.

TESTED AT I-T-E to assure ease of installation, and top performance under operating conditions.

SHIPPED FROM I-T-E to assure prompt delivery of one complete "package," ready to install.

I-T-E MAKES IT EASY TO BUY COMPLETELY COORDINATED UNITS

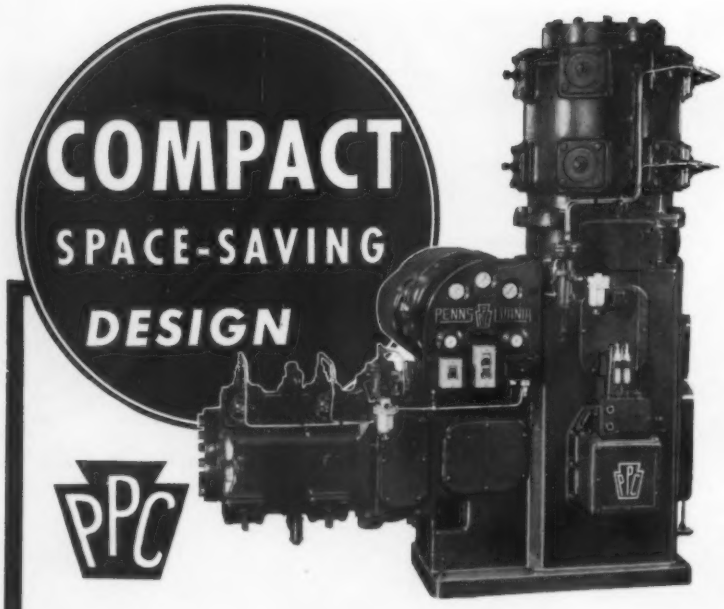


Only I-T-E builds transformers and switchgear in the same plant. This permits them to assume all responsibility for your unit substation requirements. Close association of engineering and production relieves you of detailed planning, paperwork, and the problems of coordinating deliveries. Shipment is from one location. Installation is speeded. Substation components are completely integrated to provide top performance at low overall cost.

Typical of the extra value which *only* I-T-E Unit Substations offer is circuit breaker test-position with doors closed—and without removing them. This means additional safety to operating personnel, greater cleanliness, simplified tagging out of circuits, and longer life. I-T-E Secondary Unit Substations can be supplied for any application, indoor or outdoor, and in any standard rating. For details, contact the I-T-E sales office nearest you. Or write I-T-E Circuit Breaker Company, Switchgear Division, 19th & Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division

For more facts circle 606 on Reply Card



Pennsylvania

ANGLE COMPRESSORS

These compact, heavy duty compressors are in demand wherever flexibility is desired . . . wherever space-saving is essential!

- PACKAGE DESIGN makes close quarter installation practical.
- SAVES HORSEPOWER—Maintenance is economical, too.
- FOUNDATION—A small foundation is all that is needed. Installation and relocation a minor matter.
- BUILT-IN MOTOR requiring no foundation.
- BUILT-IN INTERCOOLER with automatic drain. Full force feed lubrication to frame and cylinders. Automatic shut down in event of oil failure.
- AIR CUSHION VALVES noted for long life and tight seating are constructed without bolts, nuts or screws to work loose or burn fast.

The answer to your compressor requirements may very well be these compact, self-contained ANGLE type compressors. Write for descriptive bulletin HAE.

PENNSYLVANIA PUMP AND COMPRESSOR COMPANY
Main Office and Works: Easton, Penna.

EARNING CONFIDENCE SINCE 1920. E-PP342-1156

PENNSYLVANIA PPC PUMP AND COMPRESSOR COMPANY

For more facts circle 607 on Reply Card

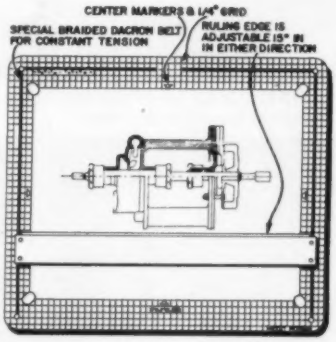
NEW PRODUCTS

(Begins on page 150)

over Zinktron, but it is smooth enough to serve as a finishing coat. It is light grey in color. Constad Laboratories.

41—SKETCH BOARD enables accurate drawings

You can make accurate scale drawings in any location, in or out of the plant with the Sketch-Faster, manufacturer states. Of tempered Masonite construction, the board has a hard drawing surface, center


CENTER MARKERS & 1/4" GRID
SPECIAL BRAIDED DACRON BELT FOR CONSTANT TENSION
RULING EDGE IS ADJUSTABLE 15° IN IN EITHER DIRECTION

markers, and ¼-in. grid for scale drawings. Ruling edge is adjustable 15 deg in either direction. Only 11 in. high and 13 in. wide, the Sketch-Faster, fits in your briefcase—or a zippered vinyl carrying case can be purchased. According to company, this versatile drawing board can also be used by stenographic personnel for doing accurate line work on office forms. The Sketch-Faster sells for around $5.00. Lloyd Tool Corp.

42—PROTECTIVE COATING for printed circuit boards

No. 391F Flux Coat is announced as a new material for protecting printed circuit boards against corrosion during storage. A mixture of rosin and quick drying non-blush solvents, the coating can be applied after etching and cleaning copper printed circuit boards. It can be applied by brushing or spraying, and dries in approximately 20 min to a hard, non-tacky varnish-like finish. Because the coat is compatible with flux used in the final dip soldering operation, it is claimed not necessary to remove the protective coating. Alpha Metals, Inc.

43—CONVEYOR BELT goes around small pulleys

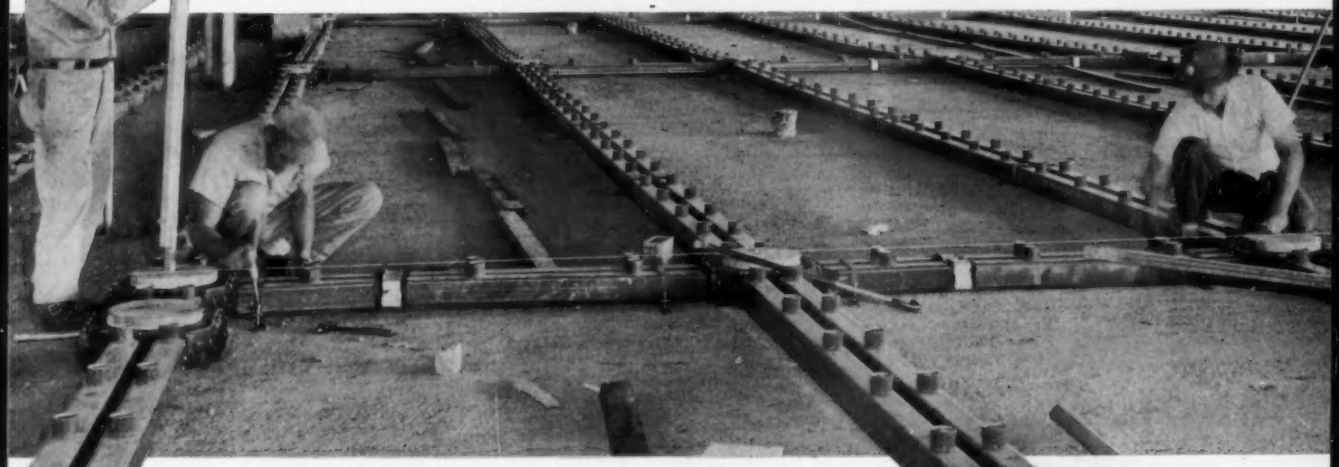
Combining flexibility of solid woven belting with strength and low elongation characteristics of stitched canvas, the Main Rusco SC-18 Belt is designed for general purpose conveying over pulleys and rolls as small as 3½-in. diam or less. The new belt is sewn on ¼-in. centers and is inner stitched on ½-in. centers for greater strength—even three-

Eliminate the hazards of overhead wiring with

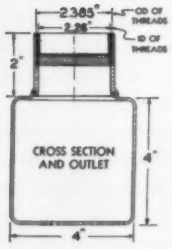
JUMBODUCT

THE HEAVY-DUTY ELECTRICAL RACEWAY THAT PROVIDES EVERY POWER REQUIREMENT IN THE FLOOR

National Electric JUMBODUCT now offers industry three times the capacity previously available plus freedom from the hazards of overhead wiring. It permits flexible, attractive, plant layouts by providing readily accessible electrical underfloor distribution at a minimum investment.



Check these JUMBODUCT features



Plenty of capacity

4" x 4" Cross Section—more room for wires

Efficient power distribution

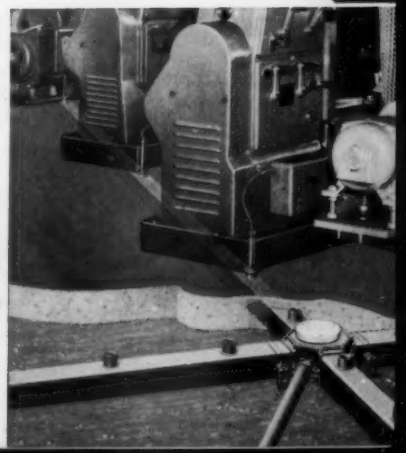
2" pipe threaded outlets every 24" permits exact location of equipment

Low Cost

- Easy-to-handle 10′ lengths
- Same simple installation procedure as standard Nepcoduct
- Quick access to inserts
- Investment in conductors limited to today's needs with ample space for tomorrow's additions

Safety

- Protected against corrosion by Sherardizing.
- Coated with a baked-on acid-resisting enamel.
- A completely grounded all-steel system.



Get the details on JUMBODUCT today! Write for your free copy of the engineering Data Book on NE JUMBODUCT

National Electric Products

PITTSBURGH, PA.

2 Plants • 11 Warehouses • 35 Sales Offices

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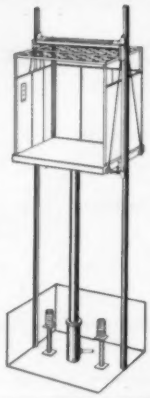
Most practical elevators for rises up to 55 feet

ROTARY OILDRAULIC® ELEVATORS need no penthouse or heavy sidewalls

Save up to 25% on elevator costs—Oildraulic Elevators are designed for low-cost installation and economical, trouble-free operation. No penthouse or heavy load-bearing shaftway structure needed... powerful hydraulic jack supports car and load. Rugged car construction withstands shocks and jolts of power truck loading. Automatic floor leveling within ¼" guaranteed, regardless of load size or rate of speed. Car sizes, capacities and controls as required.

Over 100,000 Oildraulic Elevators and Lifts are now in use. Rotary's coast-to-coast field organization provides prompt, efficient installation and service. Mail coupon below for catalogs.



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Send catalog on ☐ freight ☐ passenger elevators to:

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City_____ State_____

Rotary®

OILDRAULIC® ELEVATORS

For Freight or Passenger Service

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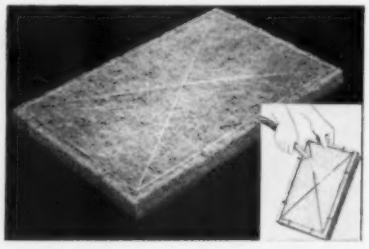
NEW PRODUCTS

(Begins on page 150)

ply belts are inner stitched. The belt can be used on either side as desired. Currently available in three- and four-plies in a variety of widths, the belt can be supplied in normal lengths and impregnated or coated with normal treatments for stitched canvas or solid woven belting. Main Belting Co.

44—AIR FILTER is maintenance minimizer, long lasting

Once installed, this filter will last for years, company announces, and it is applicable for any forced air heating, air conditioning systems and spray booths using panel filters. It comes in standard sizes; special sizes are available, too. According to manufacturer, these filters are



designed with a natural filtering element that depth loads rather than surface loads, thus capturing much more than most throw-away filters while priced only a few cents higher. They have flexible frame with free-forming edges to give a tighter fit. When dirty, the filter can be washed with cool water, drained and replaced, it is pointed out; or cleaning, with filters still in place, can be done with compressed air or vacuum cleaner. Company says this filter doesn't absorb water, so there is no need to wait for drying after the filter has been washed. Imperial Air Filter Co.

One of these products may be "just what you're looking for." Use the handy Reader Service Cards to ask for more information on it.

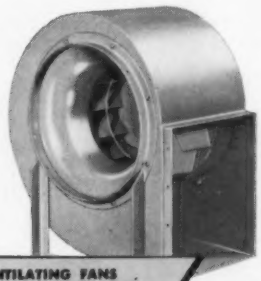
45—REGULATOR closes to prevent overheating

No. 997 is announced as a safety-type temperature regulator that closes automatically to prevent overheating and possible damage to products in process, in the event the thermostatic unit is accidentally damaged. This regulator contains a large (4⅝ in.) bellows for more powerful response and smoother modulating action in controlling the flow of steam, hot water or other medium. Because it has a tight-closing single-seated

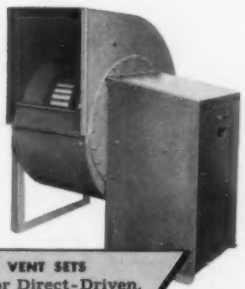
Bayley Engineered AIR HANDLING EQUIPMENT

Whether used individually or in combination, the BAYLEY units shown below are designed to efficiently and economically serve your air-handling requirements. Bayley specialists have designed and engineered this equipment to assure maximum service and efficiency for every purpose for which it may be installed.

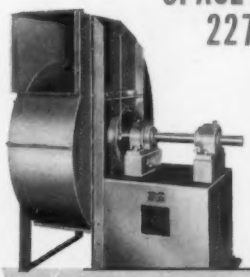
SPACE No. 227



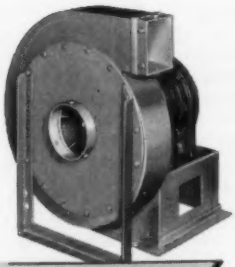
VENTILATING FANS
Equipped with forward or backward curved wheels — for Ventilating Conditioning, Mechanical Draft.



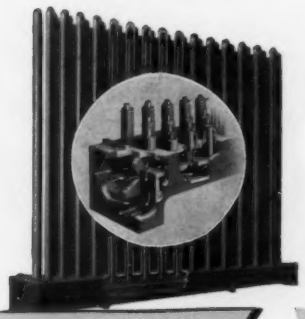
VENT SETS
Belt or Direct-Driven, designed for applications requiring moderate air volume.



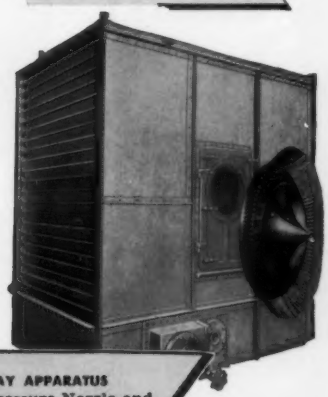
INDUSTRIAL EXHAUSTERS
Fume Exhaust, materials handling, high temperatures effectively handled with this radial-blade fan.



PRESSURE BLOWERS
For draft and conveying with moderate air volumes at relatively high pressures.



HEATERS
Blast Coils — Aerofin and Chinook; Heating and Cooling; Steam, Water, Direct Expansion.



SPRAY APPARATUS
Turbo, Pressure Nozzle and Cellular Air Washers for comfort or process conditioning applications.

Check and Mail — this Coupon for illustrated literature covering equipment of special interest to you

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Bayley Blower Company
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Please send illustrated literature checked below:

- ☐ Ventilating Fans
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FIRM.....

ADDRESS.....

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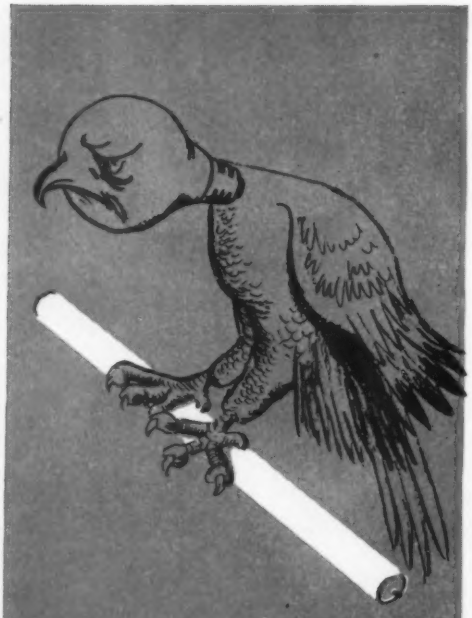
LOCK OUT THE LIGHT HAWK

WITH THIS DIAMOND MARK OF QUALITY



Champion Incandescent and Fluorescent Lamps protect your investment in lighting. They have a 57-year reputation for converting current into good light at lowest cost per year.

Champion Incandescent and Fluorescent Lamps provide sound, low cost assurance of good, dependable light sources. Their ability to burn bright and long is in turn assured by over 200 inspections.

CHAMPION

IT MEANS YOU'RE GETTING THE MOST LIGHT FOR YOUR MONEY IN LAMPS

CHAMPION LAMP WORKS
LYNN • MASSACHUSETTS

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NEW PRODUCTS

(Begins on page 150)

valve, the No. 997 is declared suitable for "dead end" or terminal service. It is available in sizes from ¼ to 2 in.

Manufacturer recommends this regulator for temperature control of industrial processes, storage or instantaneous water heaters. Equipped with reverse-acting valves, the regulator is applicable for flow control of cooling water to transformers, internal combustion engines, air compressors. Fulton-Sylphon Div., Robertshaw-Fulton Controls Co.

46—STEEL HINGE for hanging exterior doors

The Anchor Hinge is designed for hanging exterior doors of wood or metal in buildings where a door holder or door closer—in conjunction with other conditions—causes severe strain on hinges, particularly the top side. This wrought steel hinge is 5-by-4½ in. and adaptable

to doors 1¾ to 2¼ in. thick. It has four bearings, either Oilite or ball, and comes polished and plated to resist rust, or bonderized and prime coated for painted finish.

Two models are available. Model T4A 3790½ has an anchor plate or reinforcing angle extending out from both jamb and door leaf. It is used as the top hinge when a door holder or closer is mounted on the door surface. Model T4A 3791½, with an anchor plate on the jamb leaf only, is used in the same position when the door has either concealed closer or holder mortised into the top of the door. Both models come in right- or left-hand types and both are mounted at the very top of the door. McKinney Mfg. Co.

47—PENETRATING OIL in an aerosol dispenser

This penetrating oil contains molybdenum disulfide and is packaged in an aerosol dispenser for easy application. A high pressure stream of oil can be directed to difficult or overhead spots to facilitate removal of frozen fittings, nuts, bolts and sheaves. Company says this oil is fast acting and will cut rust, paint, grease, dirt and corrosion from even hot sur-

Workman impales FOAMGLAS blocks on studs welded to surface of Mississippi Chemical's tank. FOAMGLAS was quickly and economically installed because it is light, strong, rigid and easily handled.

On large stainless steel tank for ammonium nitrate storage...

FOAMGLAS insulation stays dry, fights acid, cuts heating costs for Mississippi Chemical

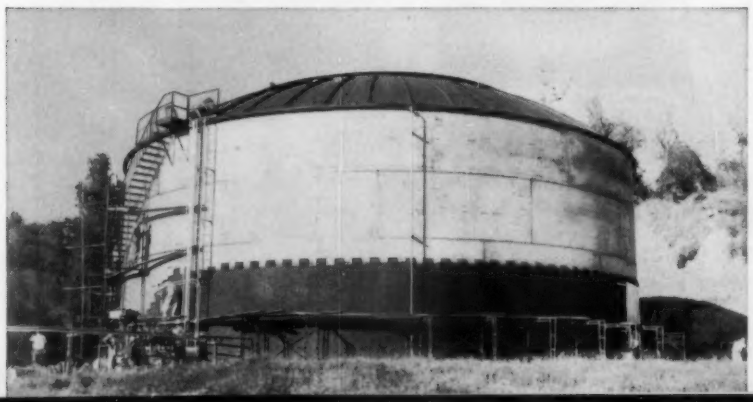
Inorganic FOAMGLAS tank insulation is helping Mississippi Chemical Corporation, Yazoo City, Mississippi, get a quick return on their bulk storage investment. Here's their report on how this unique insulating material makes possible low-cost efficient storage of an 83-95% solution of ammonium nitrate in a huge, new 25,000 bbl stainless steel tank:

"The stored solution must be held at 150° F to keep crystalline ammonium nitrate from 'salting out.' Economical heating of the solution calls for dependable insulation on the tank . . . but ammonium nitrate or nitric acid will attack ordinary insulations. FOAMGLAS solved our problem because it is composed entirely of glass, making it impervious to acid attack. Since that glass forms a nonporous structure of sealed cells—each a separate insulating unit—moisture can't penetrate it to reduce its insulating effectiveness."

Mississippi Chemical concludes: "We get insulation that never varies in effectiveness. That gives us continual heating economy. A reserve of ammonium nitrate solution is readily available for high demand seasons. In effect, productive capacity is increased, and that makes for quick return on our storage investment."

Whatever *your* tank, equipment, piping or building insulation problem, you, too, can solve it best with FOAMGLAS. Its unique combination of properties can't be matched by any other insulating material. You can prove it to yourself with a series of simple tests, easily performed in your own office. Send today for a free FOAMGLAS sample and complete testing directions. Address . . .

The heating economies insured by acid-proof FOAMGLAS insulation are helping to guarantee a quick return on Mississippi Chemical's investment in ammonium nitrate storage.



Pittsburgh Corning Corporation

Dept. PE-27, One Gateway Center
Pittsburgh 22, Pennsylvania

In Canada: 57 Bloor St. W., Toronto, Ontario

Also manufacturers of PC Glass Blocks

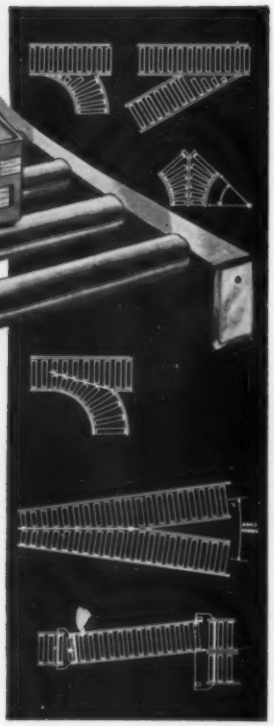
For more facts circle 612 on Reply Card

ON BUSCHMAN CONVEYORS

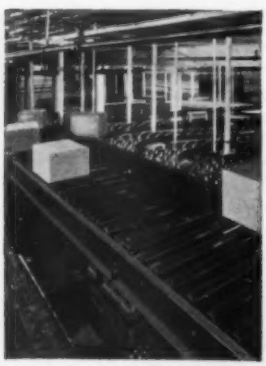
Across industry . . . in plants of all types . . . BUSCHMAN conveyors are setting new records for materials handling economy and efficiency. Engineered to individual production needs, these conveyor systems streamline plant operations . . . eliminate bottlenecks . . . reduce manual handling to absolute minimum.

BUSCHMAN offers a wide range of types and sizes to cover widely diversified materials handling applications. Gravity roller and wheel . . . live roller . . . powered belt . . . apron . . . overhead cable . . . or special conveyors can be supplied. In addition, BUSCHMAN engineers are prepared to survey your plant and to recommend the most practical, economical and efficient type of conveyor for each installation.

Whatever your materials handling requirements . . . specify BUSCHMAN for durable, versatile, profitable conveyor systems.



BUSCHMAN-designed switch and spur sections provide maximum versatility.



Typical combination system utilizing live rollers and gravity wheels.

C-1738-EWB

PRODUCE MORE . . . FOR LESS on Buschman Conveyors

WRITE TODAY FOR COMPLETE DETAILS.

Representatives in Principal Cities

THE E. W. BUSCHMAN COMPANY

4426 CLIFTON AVENUE • CINCINNATI 32, OHIO

For more facts circle 613 on Reply Card

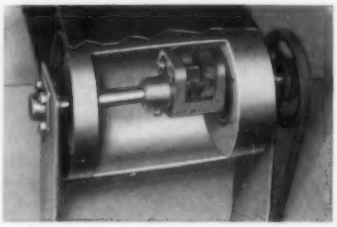
NEW PRODUCTS

(Begins on page 150)

faces, and that the "moly" contained in it is non-volatile and lubricates all surfaces it touches. Canton Chemical Corp.

48—CONVEYOR DRIVE with reducer in pulley

The Concentro Drive contains the gear reduction unit inside the pulley where it is out of the way and lubricated for life. According to manufacturer, equipment

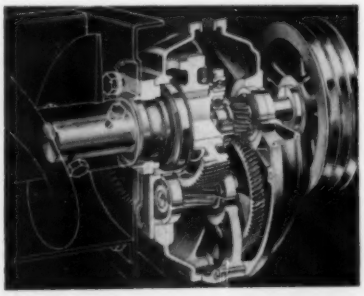


can be narrower in width and without overhang on the drive side. It can be used instead of torque arm reducers, geared head motors, and standard reducers. Variable speeds are obtained with Concentro Drive pulley by mounting motor equipped with a variable pitch pulley on sliding base. Bunke-Musser, Inc.

49—SPEED REDUCER for screw conveyor applications

As its name implies, the Screw-King Drive is a compact speed reduction unit with a flange adaptor to permit bolting directly to the trough end of a screw conveyor. The output shaft fits into the end of the pipe of a standard 6, 9- or 12-in. screw having a bore of 1½, 2, 2-7/16 in. The input shaft of the unit is driven from any type of motor by a short center V-belt drive.

The unit retains basic design of company's Shaft-King Speed Reducer, but has five additional features built in: a direct drive shaft for the screw conveyor; integral drive shaft support bearings; a double-purpose dust seal; high capacity to absorb screw conveyor thrust loads; unusual compactness. Trough ends, punched with holes to match the bolt holes in the adaptor plates and screw conveyor troughs are also furnished by company. It is pointed out that the Screw-King is bolted directly to the



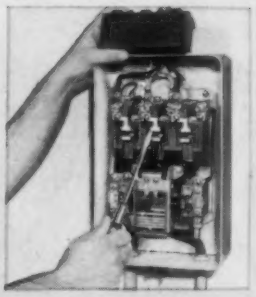
Here's Why We Specify
SQUARE D Starters
on the Machinery We Buy

PERFORMANCE, EASY INSPECTION AND MAINTENANCE

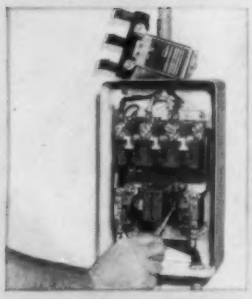
Sure, we like Square D performance because it keeps our "down time" at a minimum. BUT—everybody knows that even the best starter needs periodic inspection and preventive maintenance. We like the way Square D makes it easy to handle those routine jobs.

OFF-THE-SHELF PARTS KITS

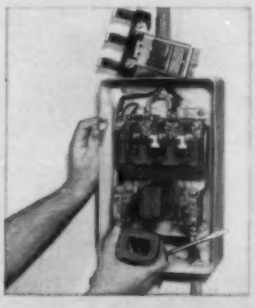
They make normal maintenance and modifications easier than ever. Packaged parts include interlocks, contacts, coils, overload relays, pushbuttons and selector switches. They're easy to buy, easy to identify, and faster to install.



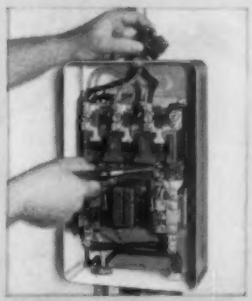
1 Loosen two screws and the arc chamber cover comes off. Every contact surface can be inspected at a glance.



2 Remove four screws and entire movable assembly can be lifted off. Disconnect two wires and slip off magnet coil.



3 Contacts are attached with separate screws—they can be removed and replaced without disturbing any wiring. A screwdriver is the only tool needed.



4 Sizes 0 through 4 starters have these separate mounting electrical interlocks for easier installation. Contact block is attached from front of panel with two screws.

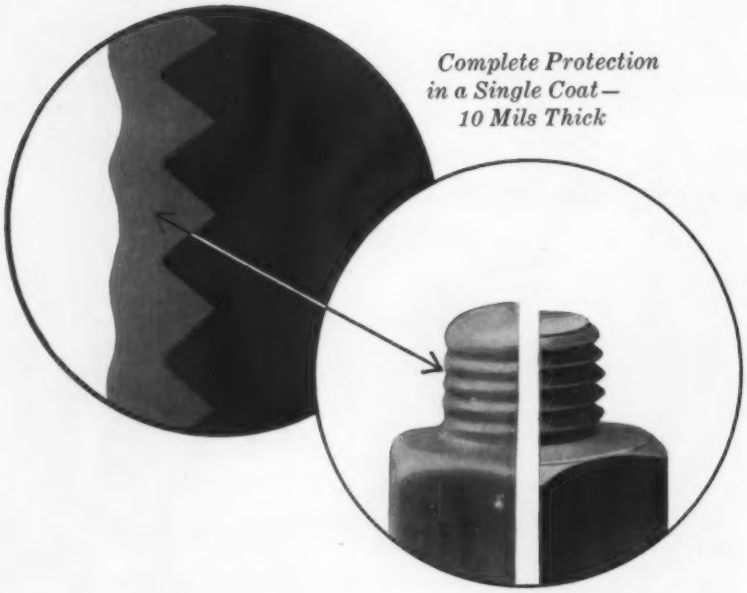
NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE!

SQUARE D COMPANY

For more facts circle 614 on Reply Card

CUT

MAINTENANCE PAINTING COSTS UP TO 50% WITH AMERCOAT 87 VINYL MASTIC



Complete Protection in a Single Coat— 10 Mils Thick

HERE'S HOW THIS REMARKABLE PROTECTIVE COATING CAN SAVE YOU MONEY:

1. One cross spray coat over a primed surface gives full protection—cuts labor costs.
2. Fewer scaffolding, rigging shifts required.
3. Less down time—dries to touch in minutes. Prevents contamination between coats.
4. Greater thickness means longer life—lower cost per square foot per year.

Amercoat 87 provides extra thickness on sharp edges, irregular surfaces; it is non-porous; will not crack or check.

Amercoat 87 combines the chemical resistance of a vinyl with the thickness of a mastic.

Amercoat® CORPORATION

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SOUTH GATE, CALIF.
Please send me 87 Technical Bulletin
Name_____
Title_____
Firm_____
Address_____
City_____ State_____

103A

For more facts circle 615 on Reply Card

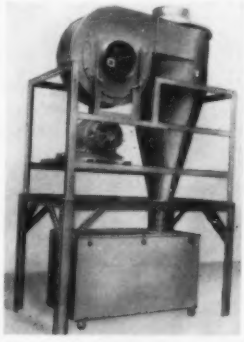
NEW PRODUCTS

(Begins on page 150)

trough end, and eliminates any tendency to wobble. The unit can be used to drive inclined screw conveyors where the angle of inclination or declination is up to 20 deg above or below horizontal. The Screw-King is made in three sizes from ½ to 10 hp, each with three reduction ratios: 5 to 1, 13 to 1, and 20 to 1. The American Pulley Co.

50—DUST COLLECTOR has roll-away collecting bin

Model 90 NB 50 is introduced for use in grinding, buffing, woodworking and other operations where a large volume of dust, chips, shavings and other residue accumulates from manufacturing processes. Its special feature is a steel roll-



away dust collecting bin having a 37½ cu ft storage capacity and large rubber-tired ball bearing casters. It can be pushed to the dumping spot or pulled out from under the collector and then handled by a fork lift truck. Luggage type clamps hold the bin top in place, and a flexible Neoprene coated hose runs from the cyclone outlet to the bin lid. This collector has an air handling capacity of approximately 10,000 cfm and uses a 15-hp motor. It is 48 in. deep, 82 in. wide and 124 in. high, and its fan inlet takes 15-in. pipe. Aget Mfg. Co.

51—FEED PUMP MOTOR makes less noise

A sharp reduction in operating noise of this 3600-rpm boiler feed pump motor has been accomplished through a new design minimizing sound level both overall and throughout the various octave bands. High frequency sound levels are reduced by sound absorbing material and baffling, while iow frequency sound is quieted through stiffening of stator frames. Available in 1000 hp and up, the new design also includes features for reduced maintenance, easier inspection and longer motor life. Inspection of bearings and stator windings is made easier by horizontally split cast iron end shields and air deflectors, and by removable top section and cover plates on each side. Feeler gage openings on end shield

The world of science behind
EXIDE-IRONCLAD BATTERIES

Being interviewed is H. A. Fuggiti, Acting Senior Development Engineer

"Here's where the heavy slugs of power come from"

At the Exide Laboratories — **Reporter:** Just exactly what part of the battery is that, Mr. Fuggiti?

Fuggiti: This is the Exide-Ironclad positive plate. And in any battery, power reserve is governed by positive plate area.

Reporter: Then do you mean that Exide-Ironclad Batteries have *more* positive plate area?

Fuggiti: Exactly. You can see that here. The cylindrical power tubes are arranged in a row. So the semicircular sides give an effective plate area one-third more than the plate size.

Reporter: How does that increase power reserve?

Fuggiti: Because there's a bigger working surface of battery plate exposed to the electrolyte. Power response is faster.

Reporter: What does this mean in battery performance?

Fuggiti: It means the battery can provide power to spare for peak power loads as well as a dependable source for continuous loads.

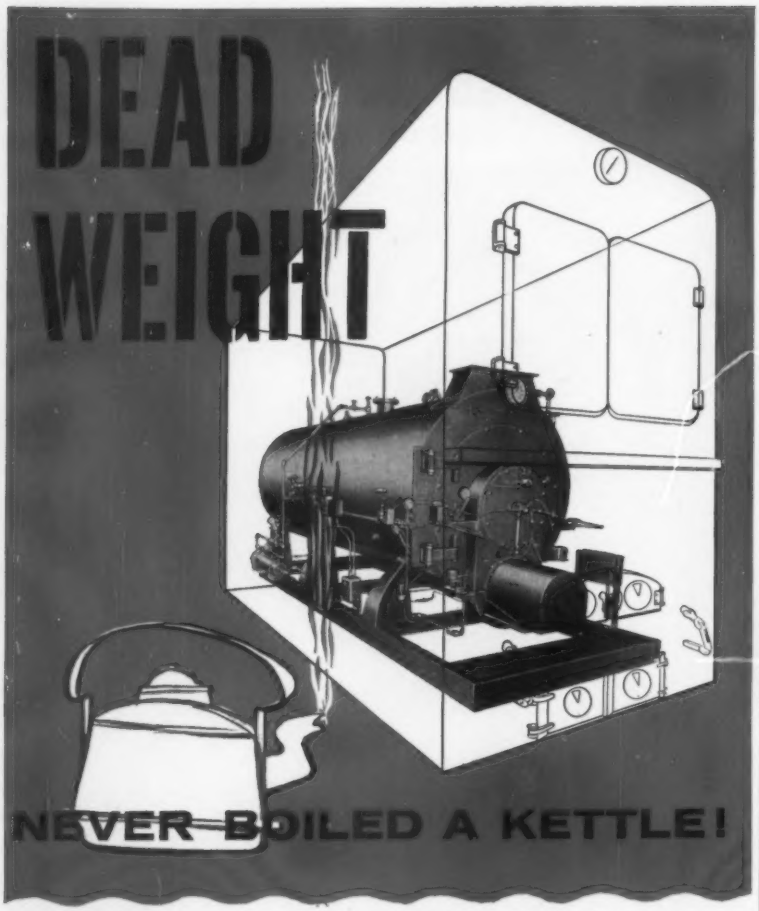
Reporter: Obviously this is an important feature of the Exide-Ironclad Batteries.

Fuggiti: Yes it is, but it's just one of many engineering details that contribute to their long life and high capacity.

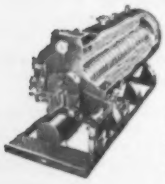
Note to battery users: Whenever you order heavy duty batteries or the equipment that requires them, be sure to specify Exide-Ironclad. For detailed bulletin, write Exide Industrial Division, The Electric Storage Battery Co., Philadelphia 2, Pa.

THE ELECTRIC STORAGE BATTERY COMPANY **Exide**®

For more facts circle 616 on Reply Card



THERE'S no practical *use* for the excess weight and bulk of the conventional steam and hot water generator, with its maze of tubes, passes and refractory baffles. The Cyclotherm design incorporates just 2 passes to give you a guaranteed minimum efficiency of 80%. Complete combustion with uniform heat-transfer in the first pass utilizes approximately 65% of your fuel value; the balance is transferred in the second pass. *Fifty* passes would accomplish no more. Cyclotherm *is* compact—up to ⅓ smaller than other packaged steam generators.



CYCLOTHERM Steam and Hot Water Generators are designed, engineered and constructed in the Cyclotherm plant to give you the finest in packaged steam or hot water generators. Factory insulation with fiberglas plus aluminum jacket saves up to $600 in field-insulation. Every unit test-fired before leaving the factory. The Cyclotherm reaches you completely assembled — five simple connections and it is ready to go to work. No expensive stack required; no special foundation. Up to 50% saved in maintenance costs by simplified design and by electronic control system that automatically operates Cyclotherm as load requires.

MANY plants have installed two or more Cyclotherms for maximum flexibility and power. Cyclotherm stands back of its product with sales engineers close by whenever you need them. Fifteen models, from 18 to 500 hp (15 to 200 psi). For full information on a boiler that represents the most advanced engineering in steam generation, mail the coupon today.

YEARS AHEAD IN STEAM GENERATION
CYCLOTHERM®
Steam & Hot Water Generators

Cyclotherm Division
National-U.S. Radiator Corp.
3143 E. First St.
Oswego, N. Y.

Send me free copy of your complete booklet on Cyclotherm Steam and Hot Water Generators

For more facts circle 617 on Reply Card

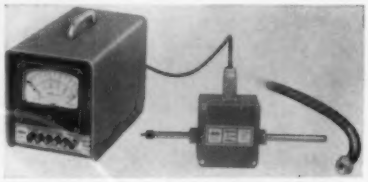
NEW PRODUCTS

(Begins on page 150)

make it easier to measure air gap. A new bearing sealing system also contributes to reduced maintenance. Static pressure is maintained on both sides of bearing to eliminate oil leakage, and slinger and labyrinth seals give added protection. Features which cut noise include a series of noise traps inside cover, a special arrangement of rotor and stator slots to reduce magnetic noise, and a change in number of rotor fan blades. General Electric Co.

52—METER gives readings on rpm, linear travel

The MF-2 Speed-Feed Meter is designed to measure and indicate linear rates of travel and rpm on all types of machines. It is reported particularly useful with lathes, boring machines, milling machines,

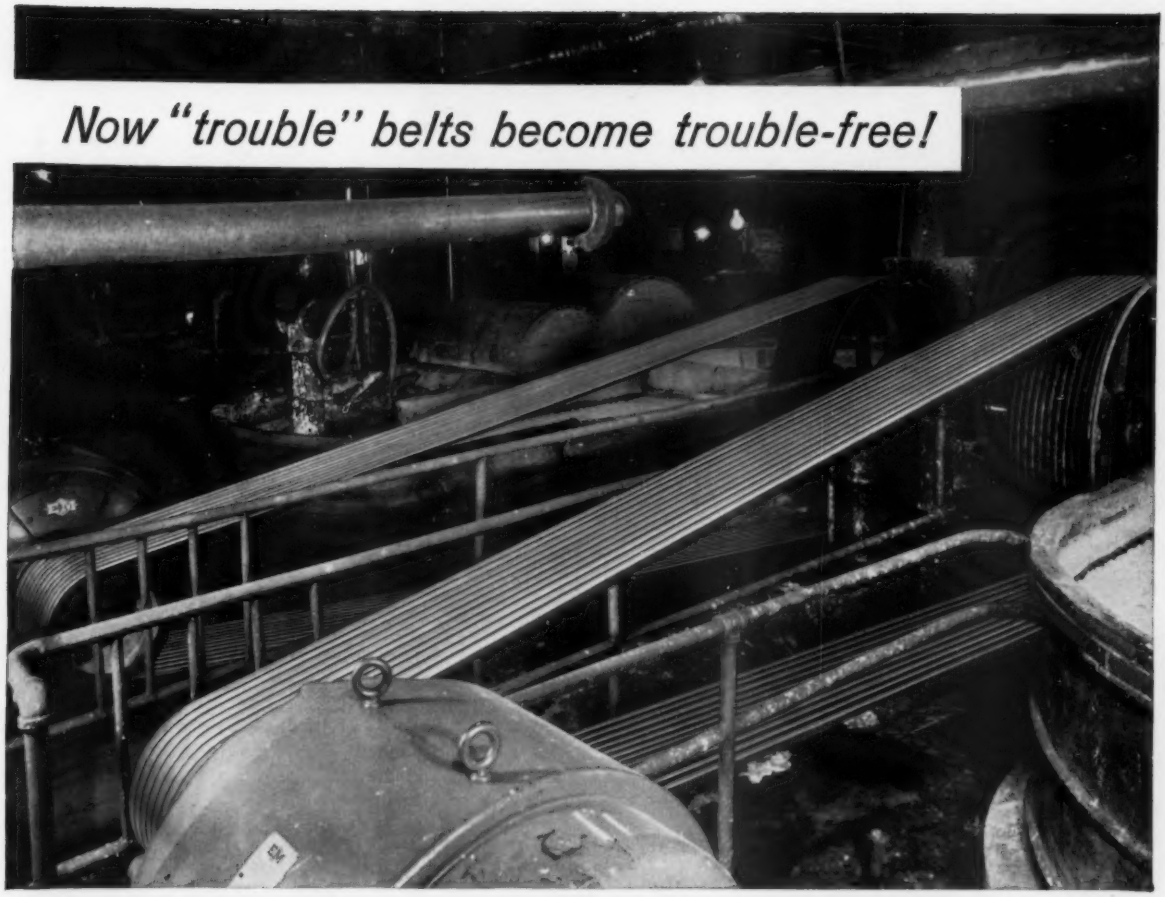


and other hydraulically actuated machines where accurate feeds must be maintained. Its feed rate pickup converts linear motion of any length of travel into an electrical signal, and a large illuminated meter gives the reading directly—with push-button selection of four scale ranges from 0-1 to 0-125 in. per minute. Models are available with four feed ranges or with combinations of feed rate and rpm scales. The small, fixed tachometer pickup has no mixing parts and is easily mounted on the machine. For rapid installation, the pickup can be fastened magnetically. Maico Co., Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 205-206.

53—AUTOCLAVE handles reactions up to 750 psi

Constructed of glassed carbon steel, this autoclave is designed to give the corrosion resistance of glass and the structural strength necessary to withstand high pressures. Reactions can be conducted where internal pressures go as high as 750 psi with complete safety, according to manufacturer; the glassed steel prevents any undesired catalysis in the product. Also, study can be made on the reaction of corrosive liquids without fear of harming this autoclave, it is stated. A wide selection of agitation can be



THE HARTFORD CITY PAPER COMPANY REPORTS:

V-belts reinforced with DACRON retain stability, withstand repeated shock loads in around-the-clock operation

REG. U.S. PAT. OFF.

Since redesigning and switching to V-belts reinforced with "Dacron"* polyester fiber, the Hartford City Paper Company reports important savings in sheave costs and space. These stronger, longer-wearing belts are installed on pulp-beater equipment operating 24 hours a day, stop and go, under severe shock loads. Despite these terriffic demands, the V-belts made with "Dacron" have dramatically cut maintenance expenses, not a lost minute of costly production time.

On the beater's two 11-belt drives, downtime has been reduced to a minimum. There is little take-up because the dimensional stability in V-belts reinforced with "Dacron" is far greater than in belts of ordinary fibers. Less stretching and slippage assure positive starting, positive working speed.

For *your* next drive, investigate the advantages of premium V-belts made with "Dacron". They combine the unique properties of the "Dacron" yarn made by Du Pont and the belt-making skills of leading V-belt manufacturers. E. I. du Pont de Nemours & Co. (Inc.), Textile Fibers Department, Wilmington 98, Delaware.

• • •

Write for your copy of "How You Can Save Money on V-Belt Drives"

6 REASONS FOR USING PREMIUM V-BELTS REINFORCED WITH "DACRON"

- Transmit up to 40% more horsepower, depending upon belt construction.
- Withstand greater shock loading.
- Longer flex life.
- Cut downtime.
- Low stretch.
- Require less maintenance.

***"Dacron"** in V-Belts* DU PONT

REG. U. S. PAT. OFF.

REG. U.S. PAT. OFF.

**"Dacron" is Du Pont's registered trademark for its polyester fiber.*

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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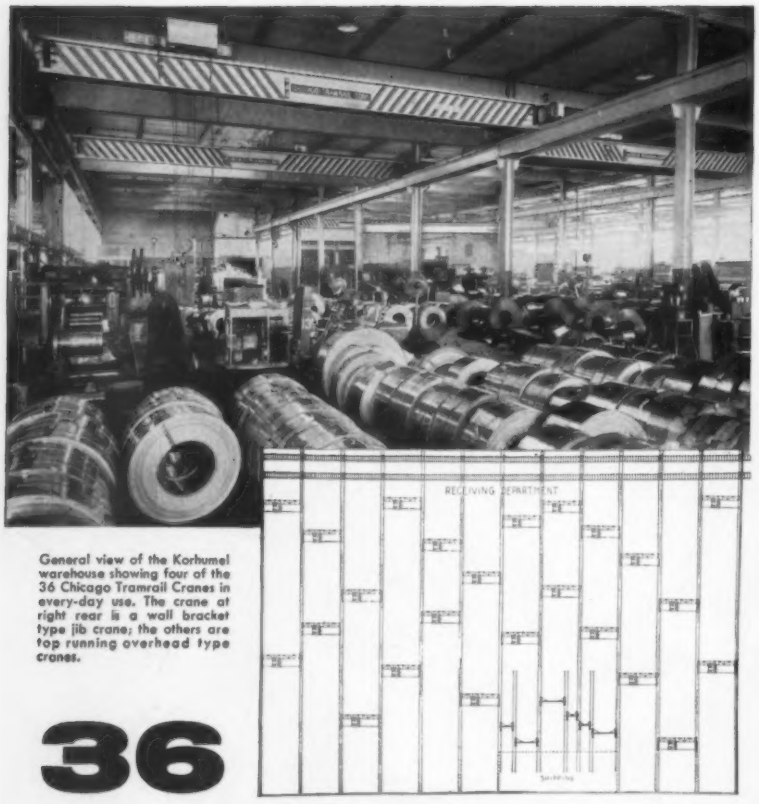

General view of the Korhumel warehouse showing four of the 36 Chicago Tramrail Cranes in every-day use. The crane at right rear is a wall bracket type jib crane; the others are top running overhead type cranes.

36

CHICAGO TRAMRAIL Cranes at Korhumel Steel & Aluminum Co. Warehouse, Evanston, Ill.

Korhumel came to Chicago Tramrail for assistance in planning a complete handling system for their bulky, unwieldy steel and aluminum coils, sheets, bar stock, which would provide a smooth, economical flow of materials from receiving at one end to shipping at the other.

The Korhumel warehouse of over 160,000 sq. ft. consists of 12 bays each 40 ft. x 325 ft. and materials including coils weighing up to 24,000 lbs. must be transported to and from machines and ovens for slitting, shearing and annealing to customer specifications. Complete coverage of the entire area was required and this is exactly what Chicago Tramrail engineers provided. Types and sizes were selected to meet specific requirements and locations. Each bay has two or three top running cranes. All cranes are 5-ton and 10-ton capacity controlled from the floor by pendant push-buttons for independent individual operation, and the complete installation consists of 36 cranes.

Material flows smoothly and efficiently at the Korhumel warehouse without waiting time for crane service, and the entire installation has proved that it meets all Korhumel requirements with ease and dispatch.

Consult Chicago Tramrail engineers on your own materials handling problem. Their technical and application knowledge enable them to be of great service. *Phone, wire or write for consultation without obligation.*

Top Running Overhead Cranes—a 20-page booklet illustrating and describing the various types, sizes, component parts and features. Contains much valuable crane information. Sent promptly upon request.

CHICAGO TRAMRAIL CORPORATION
1324 SOUTH KOSTNER AVENUE
CHICAGO 23, ILLINOIS

For more facts circle 619 on Reply Card

NEW PRODUCTS

(Begins on page 150)

made from the variable speed drive; and the two-blade impeller agitators are also made of glassed steel. Provision has been made for a thermometer well, and the non-metallic rotary seal is equipped with pneumatic lubrication. Capacities are 1-, 2- and 3-gal. Full information is in Bulletin 939. The Pfaudler Co.

54—PLASTIC TUBING comes in handy zipper style

Zippertubing is used to enclose, identify and protect multi-conductor wiring. The simplicity and ease with which wiring can be encased with Zippertubing offers applications in addition to its primary use as a substitute for lacing and tying —such as wiring ducts, wire marking (in short lengths), and as a replaceable cable

jacket to protect custom cables from abrasive wear.

The zipper pull-tab used to close Zippertubing is detachable, and the tubing may be unzipped and re-used or permanently sealed with a sealer provided by manufacturer. When sealed, Zippertubing is claimed to withstand a linear strength test of 30 lb per inch. Available in nine colors, including black and clear, Zippertubing is made of polyvinylchloride plastics reported to meet specifications covering use in military wiring. It is available in continuous lengths from 20 to 1000 ft. W. A. Plummer Mfg. Co.

55—RACEWAY for wiring of solderless connectors

Improved Panel Chanel Raceways have been developed to permit quick wiring of electrical and electronic equipment with pre-cut wires already equipped with solderless connections. According to manufacturer, Panel Chanel Raceways eliminate wire bundling and lacing, reduce work and copper loss in any wire grouping operation. The new design provides slots, instead of holes. Wires with terminals can be readily passed through the slots, it is pointed out, yet there is no sacrifice in structural strength of raceway. Arrangement of wire slots permits wiring to leave Panel Chanel on same plane as destination terminal.

15,000-VOLT power cable made by Anaconda installed in underground ducts at site of major chemical company plant.

How many volts are you from lower operating costs?

The trend in plants today is to bring high voltage—5,000, even 15,000 volts—right up to working areas. The chief advantage: lower operating costs.

High-voltage distribution means better, more economical performance from motors, lights, furnaces, and other electrical equipment—because it reduces voltage losses in the electrical system.

And, as plants grow—or new processes are added—it enables management to meet new power needs without costly wiring additions.

For high voltage service, Anaconda offers a wide range of cables to fit individual needs. For example: Duralox Interlocked-armor Cable, installed without conduit; Aerial Cable that goes *over* crowded areas; plastic- and rubber-jacketed cable, resistant to water, acids, alkalies, oils.

The Man from Anaconda will be glad to explain more fully the economies of high-voltage operations—and work with your engineers on your cable needs. Offices in 27 major cities—or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

86309

ASK THE MAN FROM **ANACONDA®**

ABOUT **POWER CABLE**

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Absolute Line Shut-off

BY ONE MAN – IN ONE MINUTE!

HAMER *Visible Shut-off*

LINE BLIND VALVES

HAMER PLUG VALVES

Will not stick or freeze. Perfect for hard-to-hold fluids. Simple plug adjustment nut eliminates sticking

Hamer Line Blinds are unsurpassed for positive action, easy operation, long-life service and lasting safety. One man can open or blind a line in less than one minute, and there is nothing like a solid plate for a permanent leakproof shut-off. Bar or handwheel operation eliminates wedges, hammers, wrenches needed for spreading conventional flanges. Removes fire hazard of sparking and stops damage to equipment.

HAMER

Write for FREE catalog

VALVES, INC.

2919 Gardenia Avenue
Long Beach 6, California
Representatives throughout the United States

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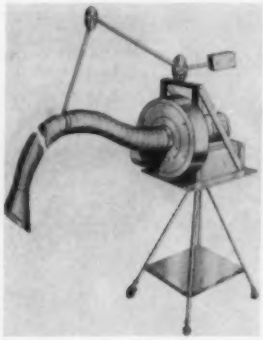
NEW PRODUCTS

(Begins on page 150)

Panel Channel has phenolic construction not affected by normal high temperatures encountered in control panels. Sizes 1-by-1 in. to 4-by-4 in. Bulletin S-301 gives data. Stahlin Brothers, Inc.

56—FUME EXHAUSTERS go directly to fume site

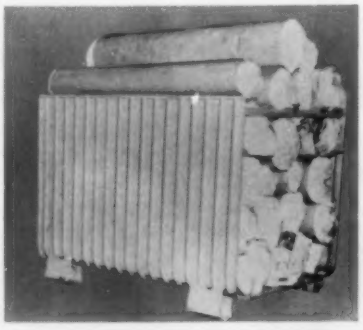
W-200-50 Stand Type Exhausters, which are movable on steel casters, are designed to go directly close-up to the fume site—apply a high suction and then push fumes



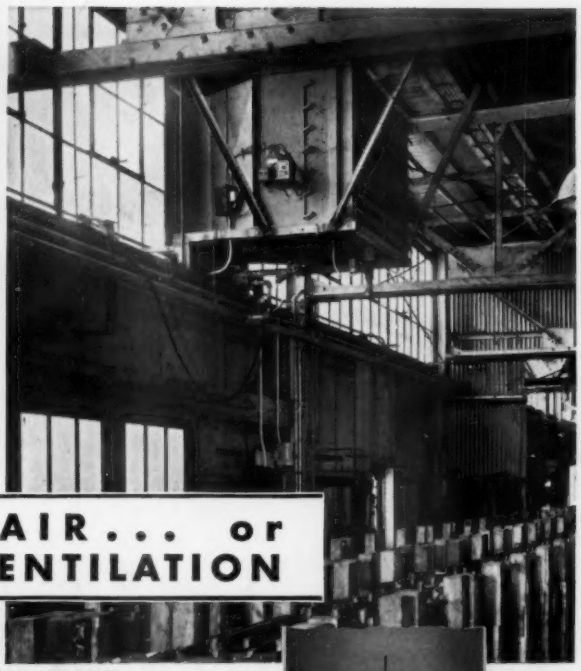
to nearest external atmosphere opening. The units comprise gasoline or electrically driven blowers capable of moving up to 800 cfm or more (depending upon individual needs), plus 8-ft stainless steel hose assemblies including arms and counterbalance for universal positioning. Engwald Corp.

57—STEEL BINS for portable storage of rolls, bolts

These open-end steel bins can be stacked to provide a portable storage section for rolls of textiles, paper, plastics and building supplies. Made of corrugated steel, the U-shaped bins are accessible from either end for loading or unloading and can be moved in any available area. Units are handled by fork lift truck, and can be tiered to any convenient height. Bins are made 36 in. high, 36 in. wide, and 52 in. deep, for handling bolts of cloth in the textile industry, but can be made to any specified dimensions. Corrugation gives added strength to bins; further reinforce-



Wing FAS-HCR Heater in factory making asbestos products



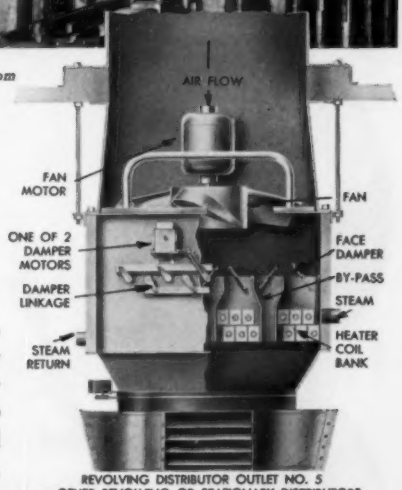
Wing FAS-U Heaters in battery-charging room

MAKE-UP AIR... or COMFORT VENTILATION

Wing FAS Heaters deliver fresh air at room temperature... with no danger of freezing

Manufacturing processes frequently create heat, fumes, vapors, dust, etc., which must be removed at the source by fans or exhaust systems, and must be replaced, both to permit the exhaust systems to function efficiently, and for the comfort of the workers. For when a building is "starved for air", cold air will rush in through cracks and crevices, trying to eliminate the partial vacuum, and consequently causing much discomfort.

Wing FAS Heaters are designed to deliver to the building an amount of air equal to that which is exhausted, and at just the right temperature. The coils of these heaters cannot freeze, for steam is at full pressure at all times. Temperature is controlled by dampers on heating coils and by-pass passages. Get the complete details in new Fresh Air Supply Bulletin FAS-1.



REVOLVING DISTRIBUTOR OUTLET NO. 5 —OTHER REVOLVING OR STATIONARY DISTRIBUTORS AVAILABLE TO SUIT REQUIREMENTS

L. J. Wing Mfg. Co.

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Factories: Linden, N.J. and Montreal, Canada
In Europe: WANSON, Haren-Nord, Brussels, Belgium

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(FRESH AIR SUPPLY)

FAS HEATERS

PE-2

L. J. Wing Mfg. Co.
177 Vreeland Mills Rd., Linden, N.J.

Please send copy of Fresh Air Supply Bulletin FAS-1.

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Firm.....

Address.....

City..... Zone..... State.....

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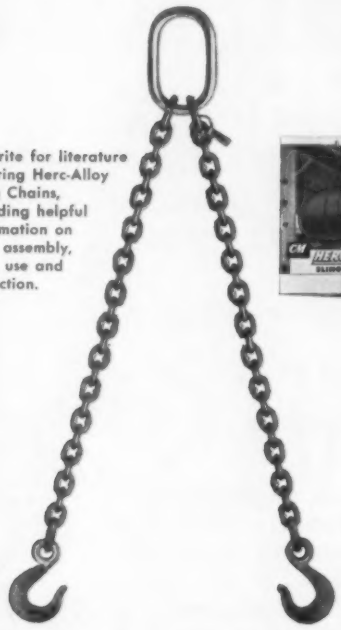
HERC-ALLOY

SLING CHAINS

● Herc-Alloy is the only exact-size alloy chain on the market. This uniformity gives you a lighter and easier-to-handle chain without any sacrifice in working load limit.

● Herc-Alloy, the original alloy steel chain, is available in running lengths as well as in all types and sizes of slings made to customer specifications.

● Write for literature covering Herc-Alloy Sling Chains, including helpful information on their assembly, care, use and inspection.



● CM also produces a complete line of chain attachments and welded chain of all types including stainless steel and bronze.

Hammerlok® COUPLING LINKS

● Assemble or rebuild your own Herc-Alloy sling chains with all components furnished by your local distributor. Hammerlok is simple, safe, reusable. New Herc-Alloy assemblies can now be ordered with welded or Hammerlok Coupling Links as desired.

CM HOISTS AND CHAIN

CALL YOUR CM CHAIN DISTRIBUTOR

COLUMBUS McKINNON

CHAIN CORPORATION

Tonawanda, New York

Regional Offices: NEW YORK • CHICAGO • CLEVELAND

In Canada: McKINNON COLUMBUS CHAIN LTD., ST. CATHARINES, ONT.

Herc-Alloy®

For more facts circle 623 on Reply Card

NEW PRODUCTS

(Begins on page 150)

ment comes from steel tie rods at front and back which run from side to side; and foot brackets aid in tiering. Pressed Steel Div., Republic Steel Corp.

58—CONVEYOR features an aluminum alloy belt

For conveyor applications where the metal belt must be non-staining, rust resistant, lightweight or have a bright surface, the Aluminum Alloy Armorbelt Conveyor is suggested. The belt is manufactured in widths from 12 to 60 in., in lengths to 200 ft. Fixed and variable

speeds are available up to 60 fpm. Strength, light weight, and smooth surface are attributed to use of spotwelded aircraft type of construction. The frame is enameled steel, although for further weight reduction, it can be made of aluminum alloy. Manufacturer says the aluminum Armorbelt retains the primary advantages of company's steel Armorbelt, including standardized interchangeable frame and belt sections, self tracking belt, ability to incorporate vertical curvers for multilevel operation. The M-H Standard Corp.

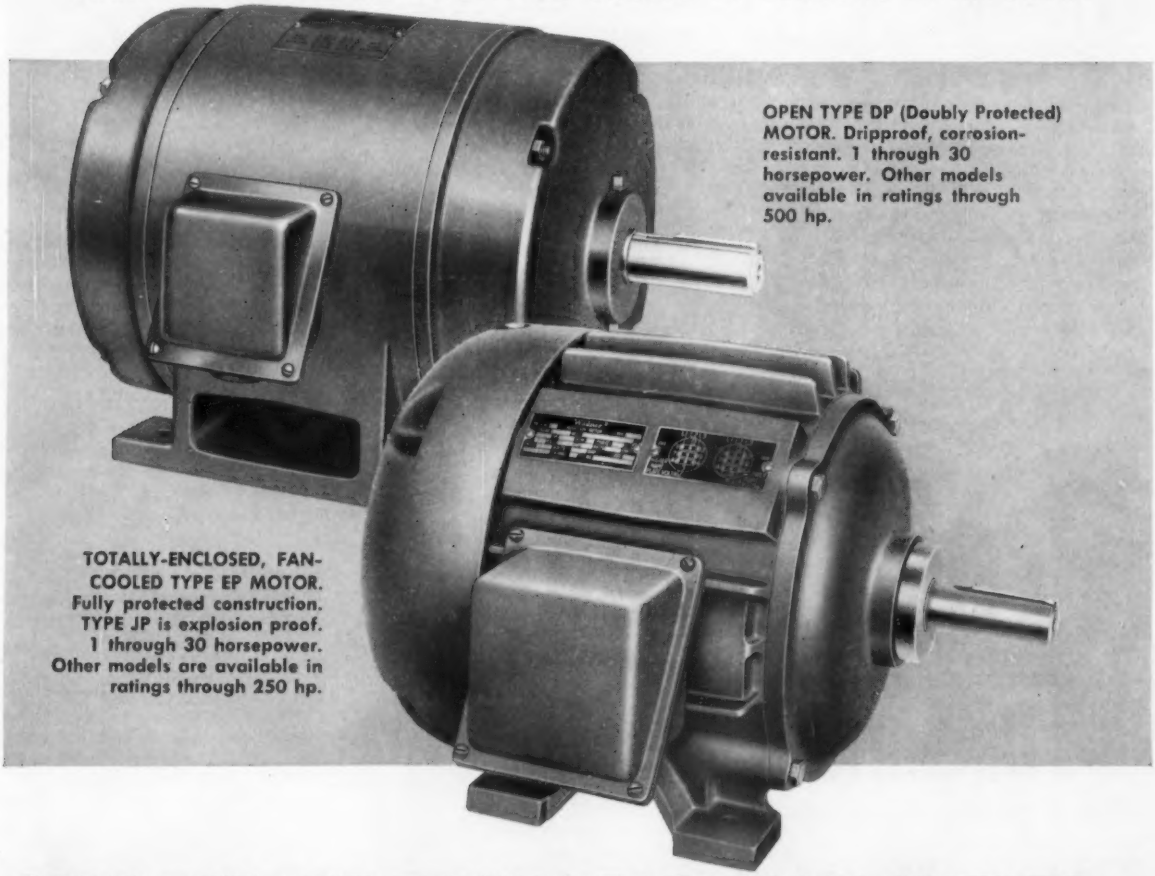
59—SOAP DISPENSER UNIT for shower installations

Reported easy to install in any shower room, this dispensing machine delivers a jet of liquid soap at the touch of a fingertip. The installation includes motor, compressor, tank and self-timing valves and is designed for use with company's Spray-Bath Liquid exclusively. It is claimed economical to use, because the amount of Spray-Bath Liquid dispensed in ¼ sec is enough for a complete bath, and a gallon of this liquid mixed with eight of water is enough for 1500 showers. Huntington Laboratories, Inc.

60—BADGE FILM for those exposed to radiation

Convenience plus saving in processing time and storage space are offered in the one-piece two-emulsion Kodak Personal Monitoring Film, Type 2, for use with badges worn as safeguards by personnel exposed to nuclear radiation. One side of the film is coated with a highly

WAGNER ELECTRIC MOTORS...THE CHOICE OF LEADERS IN INDUSTRY



OPEN TYPE DP (Doubly Protected) MOTOR. Dripproof, corrosion-resistant. 1 through 30 horsepower. Other models available in ratings through 500 hp.

TOTALLY-ENCLOSED, FAN-COOLED TYPE EP MOTOR. Fully protected construction. TYPE JP is explosion proof. 1 through 30 horsepower. Other models are available in ratings through 250 hp.

OPEN TYPE OR TOTALLY ENCLOSED MOTORS...

Wagner offers MORE for your motor dollar!

- **MORE POWER IN LESS SPACE**... These motors are built in NEMA frame sizes 182 through 326 U. They pack more power into less space for easier handling and stocking—require less space for installations.
- **CORROSION-RESISTANT FRAMES** ... Both types are built with rugged, corrosion-resistant cast iron frames. Motor feet are cast as an integral part of the frame for maximum strength and rigidity.
- **THE TYPE OF PROTECTION YOU NEED** ... Type DP motors have completely dripproof—virtually splash-proof enclosures; while type EP is totally enclosed, fan-cooled for complete protection; and type JP adds explosion proof features.
- **COOLER OPERATION**... Special baffles direct a cooling flow of air through the DP motor. Types EP and JP are fan-cooled and have ribbed frames to increase the surface area for more efficient cooling.
- **LONGER BEARING LIFE**... These motors can be re-greased when desired to prolong bearing life. Fresh grease can be added—old grease removed through openings provided in the bearing housing.
- **WAGNER DEPENDABILITY**... These two motors have the same high Wagner quality, will give the same long life performance, that have made Wagner Motors a *known* value for sixty-five years.
- Let a Wagner field engineer, expert on motor applications, show you how these motors can be applied to your needs. Call the nearest of our 32 branch offices, or write us. Bulletins MU-202 and MU-203 give complete information on these Wagner Motors. Write for your file copies today.

M57-A

Wagner Electric Corporation
SERVING INDUSTRY SINCE 1891

BRANCHES AND DISTRIBUTORS IN ALL PRINCIPAL CITIES

Wagner Electric Corporation
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES • AUTOMOTIVE BRAKE SYSTEMS—AIR AND HYDRAULIC

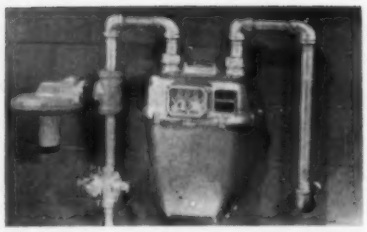
For more facts circle 624 on Reply Card

(Begins on page 150)

sensitive emulsion from which the small, routine doses of radiation can be measured. In rare cases where larger amounts of radiation have been recorded, the first emulsion is readily removed to allow measurement of the low-sensitivity emulsion. This one-piece film is designed to replace the two separate films of different sensitivity commonly used. Clip badges can be worn by the worker or attached to walls or equipment for area checking. Eastman Kodak Co.

61—SERVICE REGULATOR has increased relief capacity

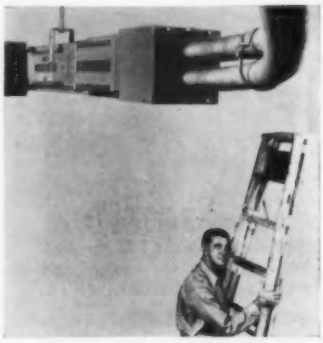
Almost double the relief capacity of previous service regulators is claimed for the Model 143. This internal-relief service is available with die-cast aluminum upper and lower diaphragm cases, and reported to combine light weight with advantages of 360-deg swivel action design, and several new safety and operational features. Its relief capacity is given as approximately 3000 cu ft per hour with outlet pressures of 1 lb or less. Three design features contribute to increased capacity: direct upward venting through the spring housing when internal relief valve is open; spring housing affording large vent area with no small restricting orifices to retard flow; and large passages on either side of the I-beam construction at the regulator throat to allow any pressure build-up to be quickly transmitted to the lower diaphragm case.



The 360-deg swivel feature enables the regulator to vent downward so that condensate does not collect in—or rain enter—the vent on outside sets. This "umbrella" feature also serves to minimize possibility of vent freezing over. Bronze bushing and valve stem are incorporated. Meter and Valve Div., Rockwell Mfg. Co.

62—BUSWAY with low impedance characteristics

Uni-Bus Power Distribution Systems are announced as combining low-impedance characteristics and plug-in construction. Their flexible construction contributes to savings in layout and installation. Special plug-in units and interlocked plug-in opening covers are designed for maximum safety during installation and relocation. Bus bars are covered until plug-in devices are fastened to busway over plug-in opening. Interlocked contacts operate so that it is impossible to interrupt the current with them, it is stated—the switch or breaker must open the circuit before contacts can be removed from the bus bar and the cover of the unit opened. Although live parts are not exposed when cover is open, contacts in open position are visible.



Corprene separators and liners provide a resilient mounting which clamps the bars sufficiently to permit vertical mounting. It is noted that at each joint, phase collection provides load equalization and high short circuit strength with approved ratings to 50,000 amp rms. The connectors consist of two attachment boxes joined with flexible conduit and cable. Busways come in copper or aluminum with single run ratings of 225, 400 and 600 amp in

Profit Maker

Delpark

Filter-Matic

TUBULAR SCREEN FILTER

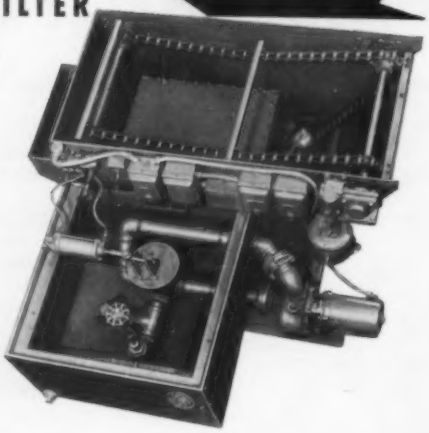
- AUTOMATIC, SELF CLEANING
- HIGH CAPACITY
- SAVES FLOOR SPACE
- OPTIONAL PRE-COAT FEATURE
- PERMITS LOW MICRO-INCH FINISH

5-1000 G.P.M. FLOW

The Delpark Filter-Matic will reduce your operating costs. Here are a few of the ways in which savings can be made.

1. Increased machine efficiency in accuracy and productive time.
2. Reduced maintenance cost in eliminating unnecessary machine wear and reservoir cleaning.
3. Extended grinding wheel and coolant life.
4. Lower coolant operating temperature reduces rejections.
5. Permanent filter media . . . adequate in most cases.

The Delpark Filter-Matic can perform these savings and many others for you. Let a Delpark Field Engineer give you the complete story.



Delpark

. . . FIRST in Filtration Advancements

INDUSTRIAL FILTRATION COMPANY
165 INDUSTRIAL AVENUE
LEBANON, INDIANA

For more facts circle 625 on Reply Card

Automatic DOCKER...THE LIFT TRUCK THAT WORKS WHERE OTHERS CAN'T

Shortest in its class... unmatched for easy maneuvering ...and for efficient low-cost operation

PAPER—Marcal Paper Company slashes loading time per boxcar from 12 man-hours to 1½ man-hours. DOCKER illustrated is equipped with rotating paper roll clamp for unloading and tiering 800 lb. paper rolls.

Illustrated are only a few examples of the DOCKER'S versatility. This extra-compact, more maneuverable truck offers more advantages than any other of its type for materials handling in any industry. It is especially desirable where space is limited... works with ease inside trailers, freight cars and in aisles too narrow for other similar trucks.

What's more, direct comparison shows clearly how definitely superior the DOCKER really is. Here are the figures:

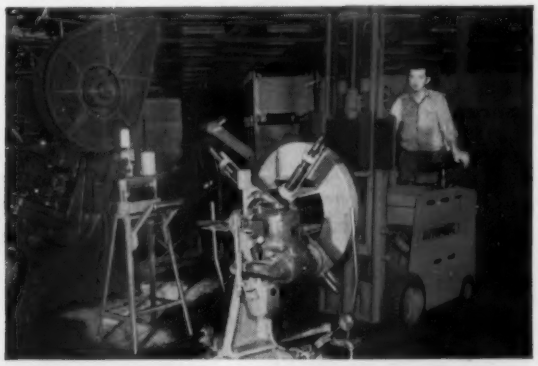
	DOCKER	TRUCK A	TRUCK B	TRUCK C
2000 LBS. WITH LOAD LENGTH OF	48"	30"	40"	30"
SHORTER..... OVERALL LENGTH LESS FORK	53⅞"	65⅞"	65½"	64"
SAFER-EASY ON, EASY OFF..... STEP HEIGHT	7"	13"	13¾"	13⅞
MORE PRODUCTIVE..... LIFT SPEED F.P.M.	65	55	45	45
MORE VERSATILE..... GRADE CLEARANCE	45%	43.4%	45%	35%
MORE MANEUVERABLE... TURNING RADIUS	56"	59"	64"	57"
MAXIMUM HEAT PROTECTION. CLASS H, SILICONE INSULATED MOTORS—ALL MODELS	Yes	No	No	No

Send today for complete information including case histories of installations similar to your own.

Automatic

Dept. B-7, 105 West 87th Street
Chicago 20, Illinois

FOOD AND COLD STORAGE—Operating in temperatures ranging from plus 38° to minus 10° F. dependable Automatic DOCKERS working around-the-clock speed handling of perishable foods for Inland Storage Co. Fifteen cars at a time can be unloaded at the above dock deep inside this mammoth "deep freeze."



FABRICATED METALS—DOCKER is placing steel coil on an automatic feed device for a punch press in the new Briggs and Stratton Plant, Milwaukee. Throughout this plant, which is a model for plant planners, DOCKERS keep materials moving from receiving through production to shipping.

For more facts circle 626 on Reply Card

For the engineer with vision . . .

CARBON GRAPHITE BEARINGS

. . . reduce maintenance costs

OPERATE DRY OR SUBMERGED

WITHOUT ATTENTION IN "INACCESSIBLE" LOCATIONS

HOT OR COLD

IN OVENS OR DRYERS TO TEMP. OF 800 DEG. F

WITHOUT LUBRICATION

These industries now use them . . .

STEEL INDUSTRY
UNDER MOLTEN TIN, HIGH TEMPERATURES & DUSTY ATMOSPHERIC CONDITIONS

PAPER MILLS
ON DIGESTERS, DRYING ROLLS, SIZEING MACHINES

FOOD PROCESSORS
SHAKER SEPARATORS, PICKING TABLES, CABLE CONVEYORS, MEAT OR FOOD ROLLER CONVEYORS

CAN MANUFACTURERS
IN LITHOGRAPHING OVENS, OVERHEAD CONVEYOR SYSTEMS

GLASS COMPANIES
SIZEING HEADS, MOLDS, WHEELS ON FLUORESCENT TUBE EXTRUSION LINES, GUIDE WHEELS AND BEARINGS

ALUMINUM & LIGHT METAL COS.
EXTRUSION LINE WHEELS

RUBBER COMPANIES
DISTRIBUTION CONVEYORS

PUMP MANUFACTURERS
THROTTLE BUSHINGS

HAVE "YOU" TRIED THEM

Write Dept. 4 P for information

ELECTRO-NITE CARBON CO.

8603 TORRESDALE AVE., PHILADELPHIA 36, PA.

For more facts circle 627 on Reply Card

NEW PRODUCTS

(Begins on page 150)

two-, three- and four-pole housings. An 800-amp rating is available in copper. Westinghouse Electric Corp.

63—COMPACT SWITCH for use in limited access areas

Here's a switch that can be installed in hard to reach areas and actuated by screwdriver. Designated the 1RA1, this compact switch is reported especially handy for use in out-of-the way places or where a switch needs to be operated

only occasionally, as when testing circuits. It can be installed deep inside equipment and operated by inserting a long screwdriver through an access hole. The switch is a subminiature single-pole double-throw assembly. It has a slotted actuator head, with 90-deg rotation that shows switch position. Its bushing permits one-hole mounting in panels up to 3/32-in. thick. Manufacturer states that this switch is UL listed for 5 amp, 125 or 250 v a-c, or 3 amp inductive at 30 v d-c. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 205-206.

64—STARTER, high voltage, features compactness

Type ZHA is a high voltage starter (2200-4800 v) only 30 in. deep. Accessible from the front, it may be mounted directly against a wall, or in double rows, back to back. This starter is self-contained, complete with control transformer supplying low voltage for push-button circuits. When starters are ganged, only one incoming feeder is required. Additional starters can be added as needed, with no sacrifice in streamlined appearance. The Type ZHA is also available with self-contained bus in an isolated compartment. It is furnished in three interrupting ratings for squirrel

The idea that solved 1000 "headaches"

The famous SBS-60 upside-down hand picture first appeared about a year ago. It dramatically illustrates how SBS-60 Cream Deodorant Soap is almost impossible to waste . . . and why it has solved literally thousands of soap "headaches" in hundreds of nationally known organizations.

What is your soap "headache":

.... soap powder spilled all over your washrooms?
.... bar soap wastefully dissolving on the shower room floor?
.... liquid soap dispensers either dripping or all clogged up?
.... constant work keeping dispensers filled and in order?
.... complaints about your soap from both men and women?
.... whatever your soap "headache", SBS-60 can help.

Write and we'll send complete information that tells you just how SBS-60 Cream Deodorant Soap "cures" most of today's soap "headaches". *Write us today!* We'll rush the details to you.

SBS research developed SBS-60 after years of study. This new type of soap is proclaimed the successor to liquid and bar soaps.

Write Dept. 57-B3

SBS sugar beet products co.

saginaw, mich. • los angeles, calif. • toronto, canada

the washword of industry

For more facts circle 628 on Reply Card

NEW PRODUCTS

(Begins on page 150)

cage, synchronous and wound-rotor motors. Bulletin 8130-F gives full details. Electric Controller & Mfg. Co., Div., Square D Co.

65—AIR CONDITIONER provides year-round comfort

This remote air conditioning unit is designed to provide multi-room central heating and cooling from the same piping system. In old buildings using wet heat systems, this air conditioner replaces radiators and, in many cases, can use the same pipes and central system by adding insulation and a chiller. In new buildings, unit room control of temperature, humidity, and ventilation is provided without ductwork.

Several advantages are cited for these units: quiet operation; one-piece front panel permitting recessed installation and quick fastening of cabinet without tools; unit assembly (motor and fan assembly remove in one piece). The air conditioners come in four series from ½- to 2-ton nominal cooling capacity and from 160 to 600 cfm, for cabinet or concealed type installation, either floor or ceiling. Airtherm Mfg. Co.

66—SPACE HEATER features induced draft burner

The 1957 Series of Counterflo Heaters incorporate a new concept of burning fuels to provide increased operating efficiency through greater air-heat volumes and to reduce fan horsepower requirements. These new direct fired forced air space heaters are available in nine sizes ranging from 250,000Btu/hr to 2,000,000-Btu/hr output capacity. Heart of the heater is an induced draft Pyro-Jet

burner suited for gas, light oil, heavy oil, or combination gas/light oil firing. Combination models feature instant fuel changeover by a manually or thermostatically operated switch. For firing heavy No. 5 fuel oil, the burner uses a dual preheating system. Fan motor requirements, based on a 75 F temperature rise, range as low as ½ hp and up to 7½ hp. Air-heat ratios range from 11,000 cfm to 16,000 cfm per 1,000,000 Btu/hr output. Tests are reported to show that these heaters operate at a minimum efficiency of 80 per cent.

The new Counterflo has two separate basic components. The furnace section incorporates burner, stainless steel combustion chamber, secondary heat transfer tubes and electronic flame failure protection. The circulating fan section contains forwardly curved, low speed, double inlet fans. This two part design provides flexibility in matching fan requirements with heater output capacities, and it permits use of low cost standard furnace assemblies for special ventilation installations, oven heating and process drying, and integration with air conditioning systems. Discharge plenum is located at top of heater. Dravo Corp.

67—FAUCET SCREW designed to lock in tapping

Screws that are too long or too short to fit the tapping properly and hold the washer firmly are a major cause of faucet leaking, according to this manufacturer. As a solution, this self-locking screw is offered. It is designed to lock in the tapping automatically, the locking action resulting from an expanding plug imbedded in the threads. The screw is made of Monel and does not rust or dezincify, it is pointed out; it can be removed, re-used. J. A. Sexauer Mfg. Co.

Look to Logan
FOR POSITIVE, CONTROLLED
POWER
For the simplest or the most complex circuit design . . . Look to Logan. Your one-source manufacturer of dependable hydraulic components to meet your particular need. The assistance of Logan's capable engineering staff is at your service to help you design the circuits to most effectively meet your production problems.
MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.
LOGAN MODEL 6031 HYDRAULIC POWER UNIT
LOGAN MODEL 972 HYDRAULIC CONTROL VALVE
LOGAN SUPER-MATIC HYDRAULIC CYLINDER
FREE! Send for the "Logan Calculator"
LOGANSPORT MACHINE CO., INC.
838 CENTER AVENUE, LOGANSPORT, INDIANA
PLEASE SEND COPY OF CATALOG:
100-1 AIR CYLINDERS
100-7 MILL-TYPE AIR CYLS.
100-3 AIR-DRAULIC CYLS.
100-4 AIR VALVES
100-5 LOGANSQUARE CYLINDERS
100-5-1 ULTRAMATION CYLINDERS
51 PRESSES
FACTS OF LIFE
67 SURE-FLOW PUMPS
200-1 HYD. POWER UNITS
200-2 ROTOCAST HYD. CYLINDERS
200-3 750 SERIES HYD. CYLINDERS
200-4 and 200-7 HYD. VALVES
200-6 SUPER-MATIC CYLS.
70-1 CHUCKS
ASC BOOKLET
CIRCUIT RIDER
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Properly designed, properly equipped by Logan.

For more facts circle 629 on Reply Card

time out for breaks?

For coffee, yes. For production equipment, no. And that's where Whitney Chain Drives should enter your planned maintenance program. These husky, heat treated alloy steel chains contribute efficient—durable—economical power transmission or conveying to your production schedules . . . take no time out for expensive shut-downs.

And Whitney's latest chain design advancements are contributing still more to improve efficiency. For example, Whitney's Single and Double Pitch Self-Lubricating Roller Chains outlast regular chains as much as 5 to 1 under rugged field conditions subject to extremes under dust or mud. They also eliminate possible contamination and spoilage on processing equipment where normal external lubrication cannot be applied. These benefits result from Whitney's exclusive sintered steel chain bushings which "oil from the inside" . . . are prelubricated for life.

And Whitney's "F-R" Processed Roller Chain is establishing new service standards for durability, particularly on problem drives involving unusual operational conditions, stresses and heavy shock loads. This performance comes from the exclusive Whitney "F-R" process which offsets excessive operational stresses in the chain.

Whitney's nation-wide field engineering and warehousing is backed up by alert Distributors everywhere who have complete stocks of A.S.A. chain and sprockets and *service* to keep your machinery on the go *smoothly*. See your nearby Whitney Chain Distributor now for that time and money saving replacement.

CREATORS OF SELF-LUBE CHAIN

Whitney

CHAIN COMPANY

232 Hamilton St., Hartford 2, Conn.

ROLLER CHAIN • SILENT CHAIN • CONVEYOR CHAIN • SPROCKETS • FLEXIBLE COUPLINGS

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at the

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(formerly the International Heating & Ventilating Exposition)

INTERNATIONAL AMPHITHEATRE—CHICAGO

FEBRUARY 25—MARCH 1

Under the auspices of the American Society of Heating and Air-Conditioning Engineers, and in conjunction with their 63rd annual meeting.

MUCH has happened in the weather-making industry during the two years since the last exposition—new advanced-design equipment that will help you cut installation and operating costs. Two years is a long time, 17,520 hours to be exact.

Catch up with progress in only 44 hours at Chicago and profit by timely information. No other exposition, the world's largest, can offer you *so much* that's NEW in the heating, ventilating and air conditioning field—from more than 450 manufacturers—*for so little.*

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480 Lexington Avenue, New York 17, N.Y.

3886

Management: International Exposition Co.

Outdoor Storage Problem?

(Continued from page 107)

from the time it is made until it is eventually scrapped.

Tool control stems from a small tool control office in one corner of the storage yard. Here a binder book is maintained, including a complete page on each tool or jig in the storage yard. This tool sheet lists the exact location of the tool in the yard, its number or other designation, and a complete history of its activity. Once the proper tool sheet is located (by consulting the index) all normal questions concerning the tool are answered. These sheets are posted everytime a tool is handled.

After a sheet is placed in the book, it is never removed until the tool or jig it covers is ultimately scrapped. This eliminates the danger of loss inherent in all card systems where a card may be "pulled" for use, then either lost or re-filed in the wrong place.

Scheduled movement of the tool train to and from the plant serves to blend the operations of tool storage and control with other plant activities. When a departmental production supervisor knows he will need a specific tool at a specific time, he notifies the tool control office. Tool is then located by using the book and scheduled for delivery at the time needed. Most tool orders are placed enough in advance of need so that foremen in the storage yard can plan the "make up" of their tool trains accordingly.

New Plant Construction

(Continued from page 126)

will represent an investment of better than $2 million.

Richmond, Ind. — Bucyrus - Erie Co., 1046 Monroe Ave., South Milwaukee, Wis., plans to construct a new drill manufacturing plant on a 148-acre site recently acquired. Construction of the new plant, will provide 300,000 sq ft of floor space for manufacturing operations. New plant will manufacture water-well drills, shallow oil-well drills and blast-hole drills. New plant with equipment will cost $12 million.

South Bend, Ind.—O'Brien Corp., subsidiary of the White Co., 101 Johnson Ave., South Bend, Ind., will expand its paint producing facilities at operations here. One of the new buildings will have 22,000 sq ft of floor space for manufacturing while the other, with a floor area of 37,000 sq ft, will be used as a warehouse and shipping center. Both facilities are scheduled to be in use by late 1957 and will cost in excess of $500,000 when completed.

Danvers, Mass.—Metal Hydrides, Inc., 12-24 Congress St., Beverly, Mass., pro-

"There stood our Founder – *up to his knees in peas*"

"If I'd laughed, I'd of been fired on the spot.

"But it was about the funniest thing I'll ever hope to see. There stood our usually dignified Founder, just about smothered in fresh green peas. And more coming.

"I knew in a flash what had happened. The power supply cable for the whole production line had conked out. The hullers are on a separate circuit, and they were still working like mad.

"I guess I did have a sort of I-told-you-so look, but I couldn't help it. Y'see, our Founder really knows the quick-freeze business, and coined that phrase 'cuddled from bloom to shipping room' that sells millions of boxes of frozen peas every year. One thing he *doesn't* know beans about (excuse me, I mean peas) is power cables, and the last time I requisitioned Okonite cables, which I've been buyin' for twenty years, he wrote, 'Disapproved. Buy Zilch cable.' I found out later that this guy Zilch makes cable of a sort, and he and our Founder were frat brothers at State back in '09.

"Anyway, to make a long story short, when I got our Founder out of those peas he sputtered, 'Take those Zilch cables out! Every inch—and get that Okonite stuff you always bought!'

"Well, I don't guess we'll have any more excitement like that for a long time, cause you can really count on those Okonite cables. But it was fun while it lasted."

where there's electrical power

...there's OKONITE CABLE

3649

For more facts circle 632 on Reply Card

ducers of powdered metal alloys, plans to construct a new hydrogen producing plant on site recently acquired near here. Girdler Company, a division of the National Cylinder Gas Co., 222 E. Broadway, Louisville, Ky., has been authorized to start preliminary engineering work on the new facility. The hydrogen plant will employ propane as feed stock and produce gas of 99.8 per cent purity. Plant is scheduled to be in operation by early 1958.

Woburn, Mass. — Sylvania Electric Products, Inc., 1760 Broadway, New York 19, N. Y., has announced plans for the construction of a 50,000-sq ft addition to company's present manufacturing facilities at a cost of $750,000 for the production of transistors, diodes, and special purpose electron tubes. New addition to electronics division will get under way at once for completion in the fall of 1957.

St. Louis, Mo.—National Lead Co., 111 Broadway, New York 6, N. Y., has announced a major expansion program of its titanium pigment plant to add 25,000 tons of titanium dioxide production to its annual capacity. Construction work will begin soon for completion by mid-1958 and new facility will cost $1 million.

Las Vegas, N. M.—New Mexico Portland Cement Co., Las Vegas, N. M., has been formed and has taken over an option on 1100 acres of limestone deposits, on which it plans to build a cement plant with an initial capacity of 800,000 bbl per year. Construction will get under way in 1957.

Syracuse, N. Y.—Carrier Corp., Carrier Building, plans major expansion of facilities here, at a reported cost in excess of $12 million. Plans include a 180,000-sq ft addition to the unitary equipment plant for added capacity. Turner Construction Co., New York, N. Y., will have charge of general construction of administration and research center; W. J. Burns Co., Syracuse, N. Y., the unitary equipment plant; and Dawson Bros. Construction Co., offices and test facilities.

Toledo, Ohio — Standard Oil Co. (Ohio) Midland Building, Cleveland, Ohio, has announced plans for a combination refinery, at local plant here. Work is scheduled to begin in the spring of 1957 and new plant is scheduled for operation by mid-1958. Cost of installation reported to be in excess of $40 million.

Duncan, Okla.—Sunray Mid-Continental Oil Co., subsidiary of the D-X Sunray Oil Corp., Sunray Building, Tulsa, Okla., has announced plans for the construction of a 6,000-bbl per-stream day, naphtha unifiner plant at local refineries at Sunray Village located here. Preliminary work will begin at once with construction scheduled for early 1957. Plant is expected to be placed in operation by late 1957 or early 1958. Installation is part of $10 million expansion program recently announced by the company.

Tulsa, Okla.—Sunray Mid-Continental Oil Co., Sunray Building, Tulsa, Okla., has announced plans for the construction of six major new units at company's refineries located at West Tulsa, Okla. Contract has already been let to Refinery Engineering Co., Tulsa, Okla., for construction of the six units. Actual construction will get under way by early 1957 for completion in the fourth quarter of that year. Cost reported in excess of $8.5 million.

Jeannette, Pa. — Elliott Co., 900 N. Fourth St., manufacturers of power plant, process and electrical equipment, has plans under way for building program to increase plant space and improve manufacturing efficiency at company operations here. Plans call for the erection of new building with a floor area of 65,000 sq ft. Plant with equipment will cost $2 million.

Pittsburgh, Pa. — United States Steel Corp., 525 William Penn Place, has announced a major improvement and expansion program of company facilities in the Chicago area to add more than 1.3 million ingot tons to its steelmaking capacity. Work on the new facilities will get under way at once for completion in early 1958.

GALVANIZE *after Fabrication*?

Welding, cutting, shearing, punching, etc., leave exposed surfaces where rust has a chance to begin. If this work is done before Hot-Dip Galvanizing there will be no exposed surfaces. That's why we say—have your products Hot-Dip Galvanized after fabrication and there will never be a weak spot in your finished product.

Members of the American Hot-Dip Galvanizers Association have the know-how to do a top quality job. Write today for a list of our members and our STOP RUST booklet.

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American Hot-Dip Galvanizers Association, Inc.
1806 1st National Bank Bldg., Pittsburgh 22, Pa.

Name_____

Firm_____

City_____ State_____

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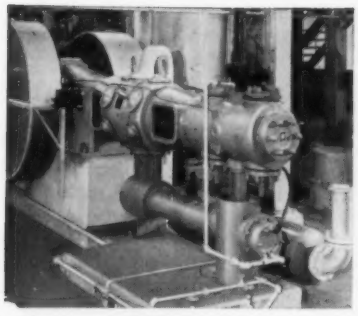
For jobs like THESE

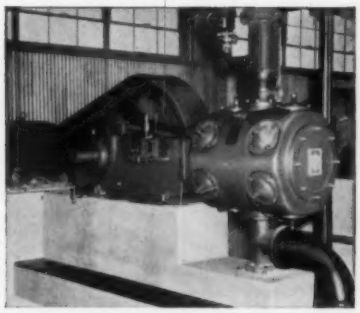
CHOOSE HEAVY-DUTY ES COMPRESSORS

for pressures to 2500 psi—sizes 5 to 150 horsepower

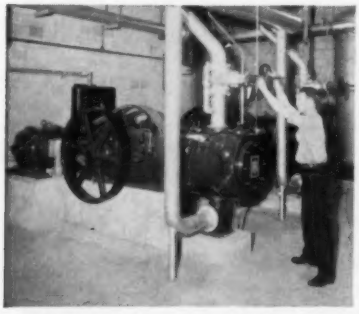


SOOT BLOWING The steam power plant of a large paper mill uses this ES to furnish high pressure air for boiler-tube soot blowing. This V-belt driven 125-hp unit compresses air to 350 psi in two-stages.

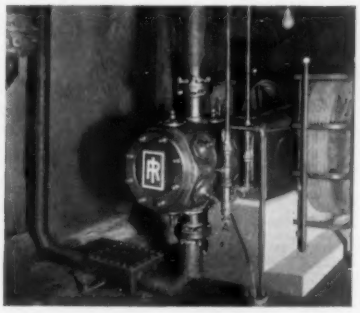
PROCESS GAS COMPRESSION In this unique outdoor installation, a two-stage ES compressor with V-belt drive compresses still vapors in a large modern gasoline plant.



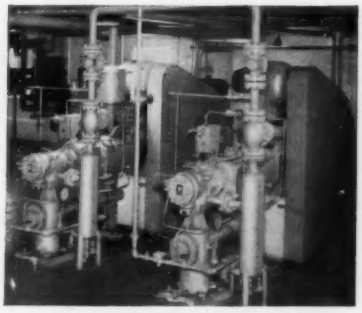
AIR LIFT SERVICE Shown here are two of the three Ingersoll-Rand ES compressors installed in a copper mine to provide pressure for elevating acid from the bleaching tanks by the air-lift principle.



GLASS MOLDING Here in a large lamp manufacturing plant, two ES compressors supply 50-psi air for cooling gas furnaces and for high pressure gas jets used in glass molding. Pressure is reduced to 30 psi to drive air-motor driven agitators.



BOOSTER SERVICE Installed on the 4600 ft level of a large mine, this Ingersoll-Rand ES compressor boosts air pressure to get full power out of rock drills and other air-powered equipment.



AIR STARTING SERVICE A large transcontinental pipeline station uses these two ES compressors to supply 250-psi starting air to its I-R gas engine compressors. Both have overhead motors and one unit is provided with a standby gasoline engine.

SHOWN here are just a few of the countless ways in which Ingersoll-Rand heavy-duty ES compressors are serving industry. A wide range of standard cylinder arrangements and types of drive enables them to meet virtually any operating conditions within their size and capacity limits. Their efficiency is high and operating and maintenance costs low. Ask your I-R representative for help in solving any compression problem.

Only I-R compressors have CHANNEL VALVES

Known for high efficiency, quiet operation and almost unbelievable durability. Entirely different. Each valve is a combination of rigid stainless-steel channels and leaf springs, with trapped-air spaces which give cushioned action.

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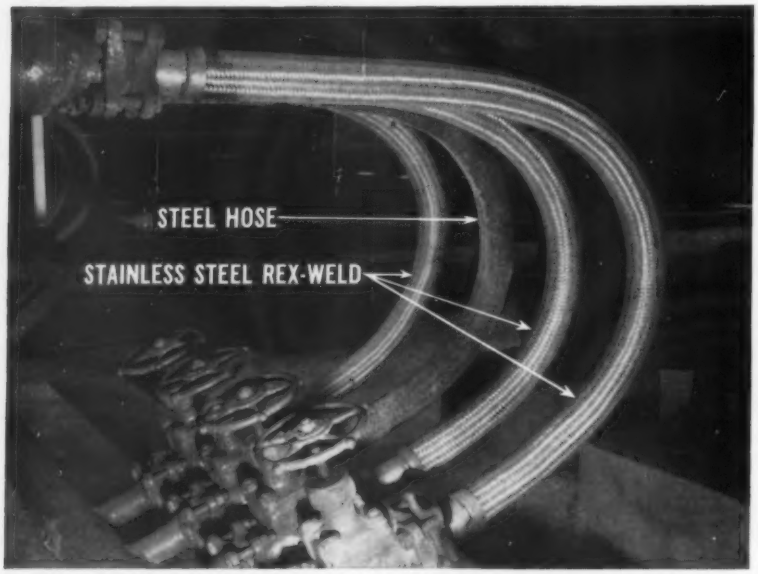
For more facts circle 634 on Reply Card

See the Difference

Stainless Steel Rex-Weld makes in this corrosive service



Connections on ammonia distribution tanks. Photo shows (second from left) one section of corroded steel hose. Other units are replacements of Flexon stainless steel Rex-Weld hose. No corrosion damage after one year of service.

FLEXON®
The Complete Line for good connections

REX-WELD
corrugated metal hose is available in stainless steel, steel, bronze and alloys; sizes 3/16" through 24", I.D.; for burst pressures to 18000 psi.

REX-FLEX
corrugated stainless steel hose; sizes 3/16" through 6"; working pressures to 3100 psi.

REX-TUBE
interlocked and square locked type hose and tubing in steel, bronze, stainless steel and other alloys; sizes 3/16" through 12", I.D. for low and moderate pressures and for use as conduit, ducting, exhaust, protective armor, etc.

CATALOG No. 152
gives basic specifications and application data for Flexon Metal Hose. Write for your copy, today.

Steel hose was formerly used for connections on ammonia distribution tanks in this plant of a leading petroleum and petro-chemical processor. However, frequent replacement was necessary due to external corrosion from atmospheric moisture. The problem was solved by installing Flexon stainless steel Rex-Weld hose.

Forty-two such units have now been in service for a year, conveying ammonia at 580 psi (constant) with no sign of corrosion, as the photograph shows. These flexible connections also absorb the radial motion present without loosening or undue wear.

Specify Flexon Rex-Weld stainless steel hose for any of your connection problems involving corrosion, internally or externally. Reduce your cost of replacing flexible connections by using Rex-Weld stainless steel hose. The extra durability of stainless steel Rex-Weld will pay dividends for you.

See your Flexonics Distributor or write for full information.

RW-29

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proved in service and backed by over 54 years manufacturing experience

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CHICAGO METAL HOSE DIVISION
1340 S. THIRD AVENUE, MAYWOOD, ILLINOIS
FORMERLY CHICAGO METAL HOSE CORPORATION

Manufacturers of flexible metal hose and conduit, expansion joints, metallic bellows and assemblies of these components.
In Canada: Flexonics Corporation of Canada, Ltd., Brampton, Ontario
For more facts circle 635 on Reply Card

INDUSTRIAL FILMS

Transformers

"TRANSFORMERS in the Making," a 16mm sound color movie, shows progressive steps in the manufacture of power and distribution transformers including tank fabrication, coil winding, assembly, testing and shipping. The final scenes, taken during the installation of a large power transformer, stress the importance of adequate field service. Narration is brisk and factual without being highly technical. Running time is 27½ minutes.

The film may be borrowed free of charge for showing to industrial, commercial, engineering and educational groups through sales branches of Wagner Electric Corp., St. Louis, Mo. For further information, write L. C. Dobrunz, Sales Promotion Manager of the corporation at 6400 Plymouth Ave., St. Louis 14, Mo.

Improving Electrical Wiring

"THE TENANT at 1010 Main" is the title of a new full-color motion picture which shows the problems of electric power distribution in large commercial buildings.

The 32-minute film is designed for viewing either by technical audiences or non-technical audiences.

The movie traces the transformation of a building manager who discovers that scrimping on electrical systems 20 years ago is costing his tenants today. He finds that a higher voltage 480Y/277-volt system for a new commercial building will save him enough to install a similar system in the now obsolescent building at 1010 Main.

"The Tenant at 1010 Main" is available free on a loan basis or may be purchased at cost from General Electric Co., Apparatus Sales Division, Schenectady 5, N. Y.

American Engineering Achievement

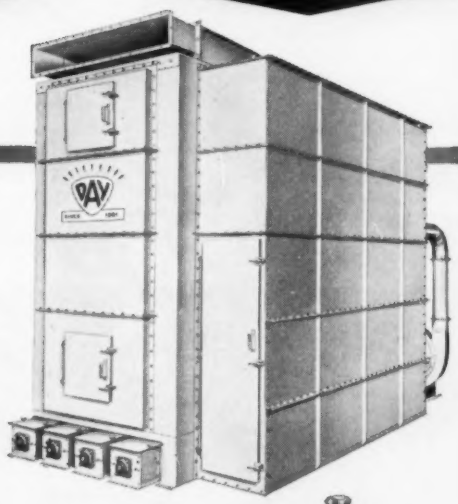
RADIO RECEPTION from the sun and stars is brought to the ears of the audience in the new Technicolor picture, "American Engineer."

The picture presents a review of significant engineering developments that almost overnight have risen spectacularly across the nation.

In its opening scenes on a mountain top in Colorado, "American Engineer" shows the operation of the new radio telescopes—the world's most sensitive "ears," which collect radio waves from outer space and provide information about the universe far beyond our own

DUST CONTROL | **BULK STORAGE** | **PNEUMATIC CONVEYING**

DAY PRODUCTS
SERVE INDUSTRY



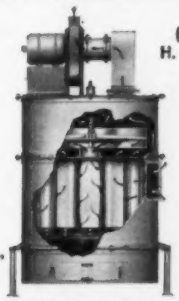
. . . CONTROLLING DUST

DAY "AC" Reverse-Jet DUST FILTER ● Dollar for dollar, feature for feature, you get more for your money with a DAY "AC" filter. Economical first cost and low maintenance PLUS the fact sub-assembly by DAY saves up to 75% on installation costs. ● Felted filtering media captures sub-micron dust particles with 99.99+% efficiency. Media porosity is maintained by self-adjusting, high pressure, reverse-jet blow rings. ● DAY filters occupy less floor space—need less headroom—are furnished to operate on suction or pressure. ● May be installed inside or outside; outside units completely weatherproof. **Write for Bulletin 559 for complete facts and engineering data.**

(Licensed by H. J. Hersey, Jr.)

DUAL-CLONE DUST SEPARATOR

Exclusive DAY design provides high efficiency with low horsepower requirements. **Write for Bulletin 49DC.**

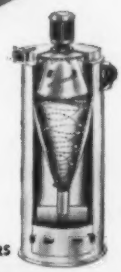


TYPE "RJ" DUST FILTER

Surge of high velocity reverse air maintains filter media porosity of this "packaged" dust filter. 99.99+% efficiency. **Write for Bulletin 560.**

TYPE "G" EXHAUST FANS

High air delivery per horsepower required. Statically and dynamically balanced; designed exclusively for dust control applications. **Write for Bulletin 471.**



DAY UNIT DUST CONTROLLERS

Complete, low cost unit combines high efficiency of DAY Dual-Clone and Exhauster. Ideal for remote locations. **Write for Bulletin 510.**

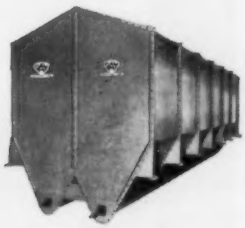
A SINGLE UNIT OR A COMPLETE DUST CONTROL SYSTEM

DAY Vertical Type Bulk Storage Bins

. . . HANDLING AND STORING BULK MATERIALS

Vertical or horizontal bins, special sizes or groups furnished to meet production needs; air lock rotary valves, twin screw feeders and other auxiliary equipment optional. DAY bins need no field riveting, soldering or welding. Built and shipped in easily erected bolted sections. **Write for Bulletins 529 and 549.**

AIR LOCK ROTARY VALVE



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INDIVIDUAL BULK EQUIPMENT UNITS OR A COMPLETE BULK MATERIAL SYSTEM

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DAY Pneumatic Conveyor equipment and systems provide a modern method of bulk material handling. Self-cleaning to prevent contamination or product deposits in system. Speed of operation improves plant efficiency. Write for details.

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Representatives in Principal Cities

For more facts circle 636 on Reply Card

solar system. Sounds from distant celestial bodies are recorded for the human audience while the picture follows the movement of the huge saucer-shaped receiving instruments as they automatically track our sun, the planets, and greater suns beyond.

Other highlights include the first atom-powered submarine, the Nautilus, capable of girdling the earth without surfacing; the world's largest open-pit copper mine; latest types of atom smashers, and a demonstration of the television-telephone. Major engineering spectacles shown are the $3,500,000 barges used on the Gulf of Mexico to drill for petroleum beneath the sea; the world's largest integrated steel mill, and the latest architectural developments in several American cities.

More than 100 other significant achievements of American engineers are brought together on the screen.

Brilliant color photography for "American Engineer" was filmed by camera crews in nearly every state. Helicopters were used in photographing engineering exploits so large that they can best be seen only from the air.

The film, which has a running time of 29 minutes, will be available in 16mm prints for large and small groups. There is descriptive narration throughout. The picture can be booked by interested groups through the producer, The Jam Handy Organization, Film Distribution Department, TRinity 5-2450, Detroit 11, Michigan, without cost except the return shipping charge.

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the Roof Ventilator
"Twins"
Bell-Ex Centrifugal Roof Ventilator
VP-Ex Propeller-type Roof Ventilator
...economical
space-saving roof units to
simplify your ventilating problems
When roof ventilators provide the answer to your ventilating needs, select one of the nyb "Twins" for maximum dependability . . . and economy, too! The Bell-Ex will exhaust against high resistances effectively from hoods and duct work; the VP-Ex is a sturdy, flexible unit that may be used where resistances do not exceed ¼ inch static pressure. The "Twins" are completely weatherproof and corrosion-resistant, easily accessible for maintenance . . . and of modern design to complement any exterior.
Write today for bulletins 565 and 566 for further details on the Bell-Ex and VP-Ex "Twins"
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Heavy Duty Flooring

SOUND AND COLOR motion picture showing the aggregate-source and preparation-technique for heavy-duty flooring for industrial plants is now available for viewing upon request.

Titled, "The Story of Emeri-Crete," the 16mm film shows the mining of Cortland emery, one of the world's hardest minerals, which is then processed into the aggregate for flooring. The processing is shown, including crushing, screening and packaging.

The 25 minute film demonstrates the preparation and application of this flooring for heavy industrial use. The flooring, made with one part cement and two parts emery aggregate, is smooth, hard and non-skid. A feature of the motion picture is the viewing of compression and tensile rating tests.

For particular information about availability of this film write to Walter Maguire Co., Inc., 60 E. 42nd St., New York 17, N. Y.

Making and Using Wire Rope

MANUFACTURE of wire rope is shown in the sound and color film, "Quality Unlimited."

Running for 30 minutes, the film

follows all the operations in the production of wire rope from basic steel making to the testing of the finished rope. Special emphasis is given to the chemical and physical tests that accompany every step in the manufacturing process. Applications and proper care of wire rope are also illustrated.

For further information on obtaining copies of the film, write to The Colorado Fuel and Iron Corp., 575 Madison Ave., New York 22, N. Y.

Eleven lines of WALWORTH Saddle Type Wedge Gate Valves

Bronze-Mounted — All-Iron — Ni-Resist

Outside Screw and Yoke — Non-Rising Stem — Quick Opening

Flanged Ends — Screwed Ends

Walworth saddle-type wedge gate valves are manufactured in eleven different combinations of designs and materials, seven of which are illustrated above.

Saddle type wedge gate valves are easy to take apart and are particularly suitable for lines requiring frequent cleaning. Walworth Saddle-Type Wedge Gate Valves are available in a variety of designs including OS & Y; Inside Screw Rising Stem, and Sliding Stem Quick Opening types—in Bronze-Mounted, All-Iron, and Ni-Resist. All types are designed to permit repacking under pressure in either the open or closed position.

FOR COMPLETE INFORMATION, See your local Walworth Distributor or write on business stationery for illustrated circular.

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NEW BOOKS

for the plant engineer

Metal Technology

METALLURGY by C. G. Johnson and Wm. R. Weeks. Size 8¼ by 5⅞ in.; 454 pp including index; illustrated; cloth bound. Published by American Technical Society, 848 East Fifty-Eighth St., Chicago 37, Ill., Price $5.50.

TITANIUM, zirconium, indium and vanadium are among subjects discussed in this practical survey of metallurgy. These are only a few of the many metals covered in this book in which the importance of chemical and physical properties is stressed.

The authors present principles and practices governing selection, testing and treatment of metals with their practical application to the problems of design and production. They offer very modern information on extraction of metals from their ores, and on refining and alloying operations.

Various steel production processes have been considered in the preparation of this book. Some of the other topics covered in the 17 chapters are the following: metal shaping and forming, surface treatments, cast iron, powder metallurgy, and bearing materials.

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For institutional and industrial plants, Realock Fence and Gates help prevent trespassing, burglary, arson and vandalism—with minimum patrol requirements.
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On Accounting

BASIC ACCOUNTING AND COST ACCOUNTING by Eugene L. Grant. Size 9¼ by 6⅜ in.; 377 pp including index; cloth bound. Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. Price $6.00.

COMPACT IN THE PRESENTATION of the subject matter, this book is keyed to the needs of the person seeking a competent knowledge of accounting. It was prepared principally for ones who do not have aspirations to become professional accountants.

Consideration of the formal books of account is deferred until the reader has been introduced to the basic ideas. The corporate form of business organization is assumed in all the initial examples.

Use of fairly short complete-cycle problems enables the author to discuss the over-all picture of job order and process cost accounting before going into numerous technical problems.

Among the topics of discussion in this book are the following: The formal books of account-simple journals and ledgers; objectives and methods of cost accounting; indirect manufacturing expense; standard costs; fixed assets and depreciation expense; budgetary control; reading and interpreting financial statements.

Collections of discussion questions and practice problems are offered at the end of each chapter.

Sprinkler Systems

STANDARDS FOR THE INSTALLATION OF SPRINKLER SYSTEMS. Size 7-5/16 by 4-13/16 in.; 162 pp including index; illustrated; cloth bound. Published by National Fire Protection Association, 60 Batterymarch St., Boston 10, Massachusetts. Price $1.00.

FIRE PROTECTION is one of the important responsibilities of the plant engineer. He must take measures to prevent fires, and, if they should start, to control and stop them. One way of accomplishing this is through good sprinkler installations. In line with this thinking, this advisory book on sprinkler work has the potential of becoming a handy addition to his library.

First section of the booklet contains general information which includes material on preliminary layouts, working plans, and maintenance. The text in the next section pertains to building preparation covering floor tightness, drafts and other details.

Some of the subjects that are pre-

sented in the remaining 11 sections are as follows: piping, valves, pipe fittings, hangers, location and spacing of sprinklers, dry pipe systems and sprinkler alarms.

On Mathematics

CALCULUS REFRESHER BY A. A. KLAF. Size 8 by 5⅜ in.; 431 pp including index; paper bound. Published by Dover Publications, Inc., 920 Broadway, New York 10, N. Y. Price $1.95.

TO THOSE ENGINEERS with an interest in a brush-up of their calculus knowledge, this book could give the impetus. Written by an engineer, it is presented in an unusual style using a question and answer system.

This refresher is divided into three main sections covering in order, simple differential calculus, simple integral calculus, and applications of calculus pertaining to various branches of engineering.

Some of the subjects treated in this book are as follows: types of growth; curvature of curves; maxima and minima; plane areas by integration; mean value; volumes by triple integration; center of gravity; moment of inertia.

Timber Engineering

WOOD STRUCTURAL DESIGN DATA. Size 11 by 9½ in.; 362 pp; paper bound with spiral wire. Published by National Lumber Manufacturers Association, 1319 Eighteenth St., N. W., Washington 6, D. C. Price $4.00.

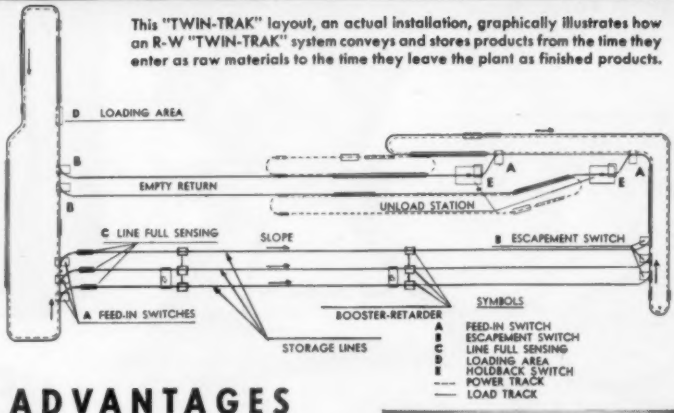
AN EXTENSIVE COLLECTION of engineering tables is presented in this publication. These can save time in figuring loads. The tabulated data pertains to such items as wood beam loads, maximum spans for joists and rafters, column loads, axial loads on stud walls, and wood truss length coefficients and angles.

The manual includes material on the physical and mechanical properties of wood, a glossary of technical terms, a list of meanings for lumber abbreviations, and various shear and moment diagrams with respective formulas.

This data book is designed for use with local building codes or the "National Design Specifications for Stress-Grade Lumber and its Fastenings." The latter publication is regarded as the standard for engineered timber construction and gives strength factors to use in calculating capacities of various grades and species. On the other hand, the WSDD manual reports the loads that the various sizes of these grades and species will carry.

Size of the design specification manual is approximately 11 by 8 in.; this 70-page publication is also available from the National Lumber Association for 50 cents a copy.

This "TWIN-TRAK" layout, an actual installation, graphically illustrates how an R-W "TWIN-TRAK" system conveys and stores products from the time they enter as raw materials to the time they leave the plant as finished products.



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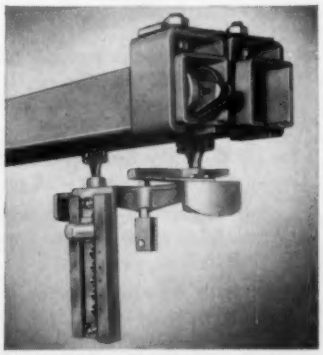

An R-W "TWIN-TRAK" System consists of one or more power tracks and as many storage or free tracks as desired. Available with efficient, economical manual or electronic selective controls designed to effectively meet your specific requirements.

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New RIDGID No. 200 Tripod Power Drive

With Folding Tool Tray

Really Portable Lightweight, legs and tray fold in snugly for carrying.

Power for any hand pipe tools ⅛" to 2" pipe, ¼" to 2" bolts; geared tools to 12".

Easily Quickly Set Up — Built-in folding tray and legs open out instantly—all one unit, no loose parts.

Extra Rigidity — Tray holds legs in solidly rigid stance, adds strength. No front leg to obstruct die stock handles.

Fast Easy Speed Chucking — Guaranteed grip, forward, reverse—no slip, even with geared tools. Replaceable insert jaws.

Extra Power Motor — Larger long-life brushes, longer commutator, won't bog down under extra load.

For service, easy work, durability, buy it at your Supply House!

RIDGID
Work-Saver Pipe Tools

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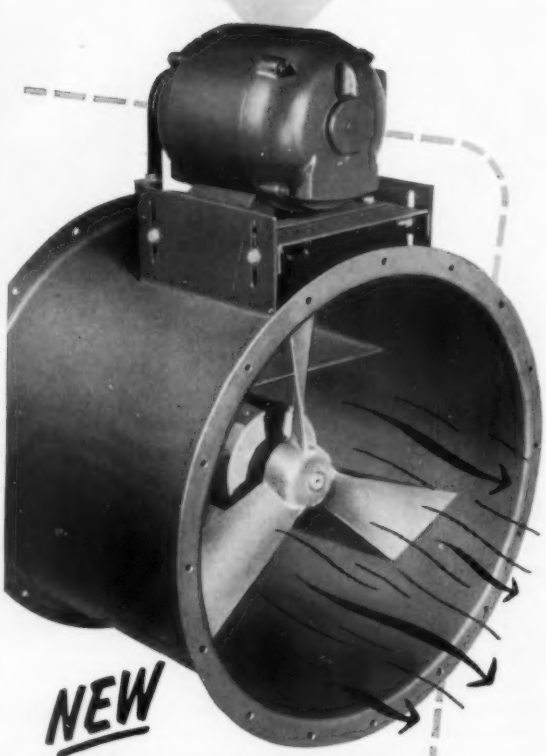
expel FUMES, HEAT AND DUST at LOW COST



NEW

PROPELLAIR®

belt driven Tubeaxial Fans

Type "BT" Propellair Fans can be purchased and operated at low cost to handle difficult atmospheres such as highly corrosive, explosive, inflammable, grease or dust-laden air. Straight-line design permits easy, inexpensive installation. Platforms and duct elbows are eliminated. The externally mounted Robbins & Myers motor, sealed cast iron housed bearing assembly, air-tight drum and belt-tube provide complete protection. Standard models can handle temperatures up to 450° F. Propellair "BT" tubeaxial fans are available in sizes 16" to 60" for from 2000 to 85000 CFM air delivery.

WRITE FOR BULLETIN NO. 620-PE

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BULLETINS

(Begins on page 21)

157 Temperature, Pressure Recorders—Catalog 1021 features descriptive information on temperature and pressure recorders. Advantages are detailed, construction features illustrated with cutaway view, and specifications included. Penn Instruments Div., Burgess-Manning Co.

158 pH Control—Reprint R-87 is a 10-pp article discussing the various types of industries which require some form of industrial pH waste treatment. Various processes are discussed and methods of overcoming difficult problems noted. Engineering aspects of continuous pH measurement are reviewed, and diagrams and graphs clarify the details. Scientific Instruments Div., Beckman Instruments, Inc.

159 Thermostatic Controls—This 8-pp bulletin describes design, construction and operation of tubular type Temp-Guard thermostats that make or break an electrical circuit by responding to changes in temperature or electrical load. They are used to protect electric motors against overheating and overloading; turning electrical current on and off in cycling systems; activating alarm systems. Booklet is illustrated with cross-section drawings, photos of models. The Franklin Dales Co.

160 Pressure Gages — Bulletin DH-23 features manufacturer's line of pressure and chemical gages for such services as engines, turbines, blowers, locomotives, hydraulic presses, tractors, pumps, and compressors or wherever a gage is subjected to violent pressure pulsations or severe mechanical vibrations. The movement is illustrated and described and advantages pointed out. Helicoid Gage Div., American Chain & Cable Co., Inc.

161 Thermal Conductivity Analyzer—Bulletin 56-1008-59, 12 pp, explains principle, construction, operation and features of the Conductherm analyzer and the Acratron electronic recorder, for use in determining amount of CO_2, H_2, He, CH_4, etc. Contains special section on gas sampling systems and how and why this analyzer is used. The Hays Corp.

162 Furnace Temperature Control—Publication GER-1206, 21 pp, illustrated, consists of series of six articles on temperature control of heat treating furnaces. Discussed are basic temperature control systems, thermocouples and control instruments, control elements, and special control systems. General Electric Co.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on the facing page.

163 Combustion Instrument—Product Specification E65-5 describes the Heat Prover combustion analyzer which indicates, by volume, oxygen and combustibles present in the exhaust gases from boiler and industrial furnaces. Operating and physical characteristics are provided, together with a list of accessories and ordering information. Bailey Meter Co.

164 Positioning Controls—Bulletin J-100, 8 pp, covers electrical remote positioning controls for both push button and automatic operation. Design and construction features are detailed, and photos, diagrams, and specifications included. The Jordan Co., Inc.

165 Magnetic Tape Recorder — Capabilities and characteristics of the Ampex FR100 instrumentation tape recorder are described in this 20-pp booklet. Detailed specifications are also provided, as well as photos showing transports, heads, and modular electronic assemblies used with the FR100. Where necessary, graphs are provided to clarify the specifications. Instrumentation Div., Ampex Corp.

166 Automatic Gross Weigher—Six-pp Bulletin 0356 describes a new automatic gross weigher that offers accurate, push-button weighing of difficult adhesive materials. Features and advantages are covered, and operation and three different types of feed arrangements are discussed in separate sections. Photos, schematics showing different feed arrangements and a dimensional drawing of the scale are included. Richardson Scale Co.

SAFETY, FIRE PROTECTION

167 Fire Extinguisher Systems—This 8-pp safety code for inspecting, recharging and maintaining fixed high pressure carbon dioxide extinguisher systems covers hydrostatic pressure testing methods, criteria for determining cylinder usability and safety precautions to observe when recharging cylinders. Fifteen inspection check-points, covering the inspection of hoses, valves, nozzles and cylinders, are also listed and discussed. Fire Equipment Manufacturers' Association, Inc.

168 Combustion Safeguards — Bulletin SC-.006, 12 pp, describes the operation and construction of company's automatic fire checks, which detect, localize and extinguish flashback in mixture supply line, where a combustible mixture of fuel gas and air is distributed to heating equipment, and safety blowouts which prevent flashback and relieve excessive flashback pressure in combustible mixture main supply piping. Photos, drawings, dimensional diagrams included. Selas Corp. of America.

WELDING, METAL WORKING

169 Welding Equipment—The full line of Ampco-Weld resistance welding electrodes and accessories is described in 28-pp Bulletin RW-10. It provides applications, specifications and dimensions of standard welding tips, wheels, dies and holders. Also presents descriptive and illustrative data on holder-to-tip adapters, quick disconnect shutoff couplings, seam welder shafts and bushings. Ampco Metal, Inc.

170 On Welding Power Supplies—This 12-pp article discusses power supplies for gas shielded metal arc welding. It details a study indicating that a constant-voltage transformer-rectifier with automatic regulations for fluctuations in line voltage is the best general purpose machine for the inert-gas-shielded metal arc welding process. Air Reduction Sales Co.

171 Drill Press—Description and specifications on a 20-in. drill press for production tooling and general use are featured in Bulletin AD-1011. Describes heavy-duty construction, large capacity and special features that make tool ideal for mass-production work. A table lists speeds, feeds and capacities, and accessories are given. Rockwell Mfg. Co.

172 Power Squaring Shears—Bulletin 69G, 74 pp, is a comprehensive catalog containing complete information on manufacturer's line of underdrive power squaring shears. Explains and illustrates such features as multi-jaw sleeve, clutch, box-type construction, self-compensating holdown; enclosed drive. Job application photos show these shears at work in fabricating plants, steel warehouses and sheet metal shops. Specifications for each of the 59 models are tabulated. Niagara Machine & Tool Works.

173 On Carbide Blanks — Publication GT-314, 35 pp, provides a price list covering made-to-order Carboloy carbide blanks. This book reflects latest carbide prices, and covers semi and modified standard Carboloy cemented carbide blanks as well as solid cemented carbide cylinders. It includes "how to order" instructions, and specifies shapes subject to extra charges. General Electric Co.

BURNERS, AUXILIARIES

174 Fuel Burning Systems—Six-pp Bulletin 1231-A describes a fuel burning system, consisting of a packaged combustion assembly utilizing gas, oil, or combination gas-oil firing for modernizing or converting existing boiler equipment, or for obtaining efficient operation from new equipment. Various elements of the fuel burning system are illustrated and typical installations pictured. Orr & Sembower, Inc.

175 Fuel Oil Pump Sets—Up-to-date means for proper preparation of heavy oil for combustion is discussed, and packaged fuel oil pump and heater sets are described in Bulletin 15. Explains how these easy-to-install units come ready for operation and are designed to exceed minimum requirements of burner. Includes engineering data table showing recommended unit sizes for various burner capacities and approximate boiler horsepower ratings. Walter H. Eagan Co., Inc.

176 For Lower Fuel Costs—This illustrated bulletin describes an industrial oil burner designed to effect a 30 per cent saving in fuel costs by using heavy No. 5 oil. A page of detailed specifications is included. Industrial Div., York-Shipley, Inc.

Among this Month's New Literature of Merit . . .

177 Unit Heaters—Bulletin 9417, 65 pp, is a vest-pocket edition of the Venturafin Unit Heater Handbook, containing specifications and operating characteristics as well as installation and application data for the Venturafin line. Designed to be easily carried in a pocket, the handbook includes capacity tables, dimensions, engineering specifications, external ductwork suggestions, mounting heights, piping diagrams, pipe sizes, sound ratings and wiring diagrams. Also included is a typical selection problem together with a recommended solution procedure. Line drawings are used throughout for further clarification of data. American Blower Corp.

178 Brushes For Industry—This 100-pp illustrated catalog (210-C) contains detailed information on power brushes, Brushmatic machines, paint and varnish brushes and maintenance brushes. Separate chapters cover power brushes, brush machines, and the paint, varnish, and maintenance brush selection, with detailed specifications and engineering data for every brush in the line. Typical uses and characteristics are described and an alphabetical and numerical index provided. The Osborn Mfg. Co.

179 Paperwork Simplification—PS Magazine, No. 44, 24 pp, describes various paperwork simplification systems, with case histories showing how a number of companies have solved their paperwork problems. Among systems described are an order analysis and shipping report tabulated on Kant-Slip continuous forms, a Zip-Set accounting method, a teletypewriting freight bill system, Cardatype-writing of orders and invoices, Univac computing, and others. The Standard Register Co.

COMPUTERS

181 Digital Computer—Bulletin AB116 illustrates and describes company's G-15D general purpose digital computer and its digital differential analyzer accessory, which considerably increases versatility and range of operations of the computer. New programming techniques and a complete line of input and output equipment are also described. Bendix Computer Div., Bendix Aviation Corp.

182 Computer Primer—This 16-pp booklet is described as a primer on the subject of digital computation, of increasing importance in automatic manufacturing and processing, data and materials handling. It explains and illustrates important rudiments upon which digital machine computation is based. Shows how the digital computer conforms to simple rules of symbolic logic. Computer Control Co., Inc.

OTHER EQUIPMENT

184 Industrial Apparel — This 16-pp 1957 catalog describes acid- and caustic-resistant industrial apparel of Orlon and Dynel. Provides test data on properties of these rugged fabrics and discusses their many advantages. A line of coveralls, service uniforms, lab coats, matching shirt and pants, T-shirts and other items are illustrated and price and ordering data included. Worklon, Inc.

185 Line Reproductions—This 16-pp catalog describes company's complete line of photographic reproduction materials for drawings: silver-sensitized papers, vellums, films and tracing cloths for making negatives and prints, and also positive-to-positive prints. Included are instructions on how to get better reproductions by the right selection and use of these materials; and complete processing directions and development time. Grant Photo Products, Inc.

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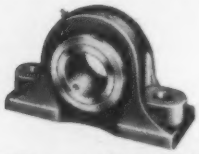

SC and SCM
BALL BEARING
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DODGE BULLETINS YOU SHOULD HAVE

- TAPER-LOCK STEEL CONVEYOR PULLEYS. Construction details, sizes, dimensions. Bulletin D56.
- ROLLING BEARINGS. Load ratings, dimensions and other data on Dodge-Timken and SC and SCM Ball Bearings. Bulletin A638.
- SEALED-LIFE V-BELTS. Construction details and data on sizes, pitch lengths and outside lengths. Bulletin A-606.

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BULLETINS

(Begins on page 21)

186 **Strapping Machine**—Bulletin AD 209 tells how steel strapping and packaging operations can keep pace with the fastest production lines with company's steel strapping machine, designed specifically for applications where compressible or solid units must be strapped quickly and economically. Typical applications as well as specifications are shown. Acme Steel Co.

187 **Automatic Brush Finishing** — This 20-pp bulletin covers the complete story of Brushmatic finishing, designed to meet industry's growing need for higher quality finishes at higher rates of production. Illustrated with photos of actual on-the-job operations, parts, before and after finishing, the bulletin also includes charts to help in the selection of the proper brush for a given application. The Osborn Mfg. Co.

188 **Retaining Rings** — This 12-pp catalog lists 24 sizes in the industrial 1000 Series open type retaining rings for shafts measuring 1/25 to 1 in.; 37 sizes in industrial 3000 Series internal retaining rings, for housings measuring ¼ to 2 7/8 in. diam. and 48 sizes in industrial 3100 Series external retaining rings, to fit shafts from ⅛ to 2¼ in. Specifications and dimensional data included, as well as photos and drawings illustrating details. Industrial Retaining Ring Co.

189 **Steel Tube Fittings**—Form 6071, a 48-pp catalog, incorporates complete engineering data on company's 7000 and 8000 Series Ermeto hydraulic flareless tube fittings and Flare-Twin SAE 37-deg flare (JIC) hydraulic tube fittings. In addition to full engineering specifications, a section is devoted to assembly instructions, materials, finishes and operating pressures. The Weatherhead Co.

190 **Insulating Firebrick** — Plant engineers involved with manufacture of structural clay products, in both salt glaze and non-glaze periodic kilns, will be interested in 8-pp Bulletin R-43. It gives a detailed description of the relationship between heat losses and the weight of refractory linings. The results of the studies performed on a number of producing installations are included as evidence of fuel savings possible with light weight insulating firebrick. Refractories Div., The Babcock & Wilcox Co.

191 **Machinery Mount** — Bulletin K2D describes vibration and noise absorbing machinery mounts utilizing Elasto-Rib as the isolation medium. Information on the properties of Elasto-Rib, and the dampers incorporating the material, is included, as well as construction and installation diagrams, and dimension and loading capacity tables. The Korfund Co. Inc.

192 **Engine Applications**—Eight engine case histories are presented in separate bulletins, with pictures and drawings illustrating applications of company's V-8 and V-12 engines of 540 to 4,000 cu in. displacement. Applications described include air conditioning, gas boosting, cotton ginning, generator sets, others. Le Roi Div., Westinghouse Air Brake Co.

193 **Research Facilities**—This 18-pp bulletin features descriptive information on facilities offered by this company for research and testing, including the hydraulics laboratory, chemical laboratory, combustion controls laboratory, fire test building, explosion chamber, others. The Factory Mutual Companies.

194 **Activated Carbon** — Eight-pp Catalog Section S-6450 is an illustrated booklet on Columbia activated carbon, featuring a discussion of adsorption as a unit operation in chemical processing, and information on properties of activated carbon that make it an excellent adsorbent. Discusses applications for gas purification and separation, air conditioning, as catalysts. National Carbon Co., Div. of Union Carbide and Carbon Corp.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 205-206.

MAINTENANCE

301 **Basic-Roofing Information**—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job. Johns-Manville.

302 **Hot-Dip Galvanizing**—How hot-dip galvanizing is prolonging life of industrial equipment is stressed in this 16-pp booklet. Photos, showing galvanized equipment in use accompany brief text explaining how this process of covering iron and steel with a protective coating of zinc serves to prevent rust. The galvanizing procedure is explained and illustrated. Coating comparison charts show how hot-dip galvanizing compares with other types of coatings as to rust resistance, dimension limits, shock resistance. American Hot-Dip Galvanizers Assn., Inc.

303 **Protective Paint**—Thirty-five case histories of successful use of protective coatings based on chlorinated rubber are included in this 20-pp bulletin, "Protection With Parlon." Photos show water and sewage works, paper mills, storage tanks, and chemical and food processing plants where these coatings have had long-term exposure to corrosive environments. Includes performance data, instructions for application. Hercules Powder Co.

304 **Painting with Aluminum**—This helpful booklet discusses advantages of aluminum paints, describes three basic types for non-absorbent surfaces, for weather-exposed wood, and for heated surfaces and those not exposed to weather. Typical maintenance applications are covered in text and picture, and practical suggestions for good results included. Use of aluminum paint on steel, galvanized metal, wood, masonry is detailed. Aluminum Company of America.

305 **Protective Coatings**—Corrosion control in the operating plant is the subject of this bulletin, which outlines several corrosion-resistant coatings systems for buildings and equipment, structural steel, towers and columns, tanks and piping. Properties and uses are given and basic requirements for control of corrosion are detailed. Bulletin also gives data on tank linings. Amercoat Corp.

306 **Cathodic Protection**—This 12-pp illustrated technical brochure presents cathodic protection systems for corrosion control. Describes effect of galvanic action on metals in contact with earth or water, and explains principles utilized by these systems to halt existent corrosive action or keep new installations free of it. Savings gained by such protection are discussed and case histories given. Some typical applications are shown, and company's engineering services told. The Harco Corp.

307 **Building Maintenance** — Handbook 7 offers 64 pp of information on floor surfacing, leak stoppers, external wall sealants, roadpatching, roofing materials. Includes instructions for applying them. Flexrock Co.

308 **Repairing Concrete Floors** — A seven-step procedure for repairing concrete floors with non-shrink mortar is described in this

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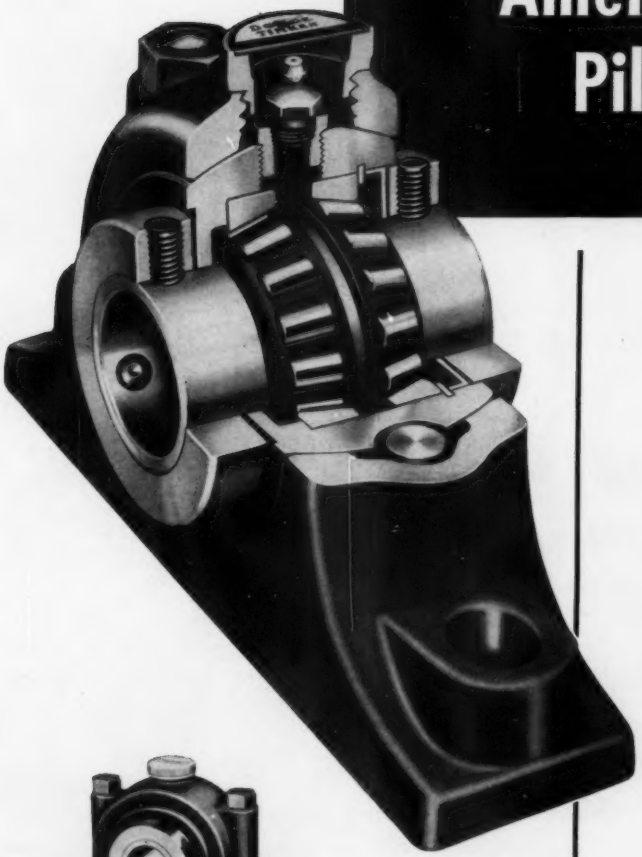

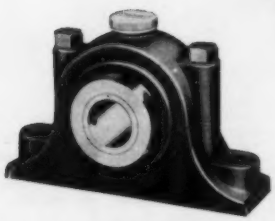

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DATA FILE

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folder, EPMM-4. Each step is illustrated with an actual photo and description of step involved. Strength comparisons between plain mortar and non-shrink pre-mixed mortar are given. The Master Builders Co.

309 **Off-the-Ground Maintenance**—Bulletin G205R, 8 pp, discusses the subject of controlling costs when maintenance goes above arm's reach. Describes trestles, swinging scaffolds, aluminum scaffolds, ladder scaffolds, step ladders, extension ladders, storage racks and other equipment designed to handle every type of overhead maintenance problem. Pictures applications. The Patent Scaffolding Co., Inc.

SLING CHAINS, WIRE ROPE

311 **Industrial Wire Rope**—Bulletin DH-128D, 24 pp, features wire rope recommendations for industrial services. Covers more than 120 types of wire ropes used in construction, conveyors, cranes, dredges, steel mill and blast furnaces, coal bridges, guy ropes, inclines, platform lift trucks and winch lines. Each recommendation covers such points as rope diameters, construction, preforming, lay, grade and core. In addition, charts covering weights and breaking strengths are provided. American Cable Div., American Chain & Cable Co., Inc.

312 **Sling Chain Handbook**—Illustrated Data Book 100, 32 pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of sling chains and attachments, and their sizes, weights and working load limits under many conditions. Columbus McKinnon Chain Corp.

CONSTRUCTION

314 **Glass for Industrial Use**—How glass is used and how to choose the proper type for the application are covered in 12-pp Catalog 56-1. Discusses glass according to function; light diffusion and glare reduction; decoration; protection; and heat absorption. Photos showing various finishes and typical installations are provided, along with performance data, selection and installation tips, light transmission ratings and other data. General advantages offered by company's line of glass are also detailed. Mississippi Glass Co.

315 **Window Modernization**—How to modernize old windows with company's glass blocks is told in 8-pp Bulletin GB-104. Selection data is included, along with photos of typical installations. Pittsburgh Corning Corp.

316 **Panel Wall Construction**—The advantages of company's M-Type Q-Panel walls are outlined in 12-pp Bulletin Q-35-55. Includes installation photos, diagrams, specifications, as well as drawings, pointing out structural details. H. H. Robertson Co.

317 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features; gives fabricating data. Alan Wood Steel Co.

318 **Steel Floor Plate**—Skid resistance and other advantages of multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, weights, data on allowable loads. Typical uses of the floor plate are pictured. United States Steel Corp.

319 **Air Tools, Paving Breakers**—These two bulletins describe company's latest models of paving breakers and air tools for plant construction and maintenance work. Bulletin PB1 gives features and specifications on heavy-duty, medium-weight and lightweight paving breakers, as well as tools for use with them. Bulletin ST-100 describes and gives specifications for clay spaders, trench diggers and backfill tampers. Gardner-Denver Co.

STORAGE EQUIPMENT

321 **Adjustable Shelving**—How this shelving can save assembly time is explained in 28-pp Form 2111. Photos and drawings of various types of shelving units, including open and closed shelving, bin units, ledge shelving, counter shelving, cabinets with swinging and sliding doors, parts and accessories are included. Standard Pressed Steel Co.

322 **Storage Equipment**—Catalog 100-E, 72 pp, illustrates and describes company's complete line of steel cabinets, folding chairs, chests and safes, stools, tool boxes, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and other specifications. Photos illustrate some typical equipment installations. Lyon Metal Products, Inc.

ELECTRICAL

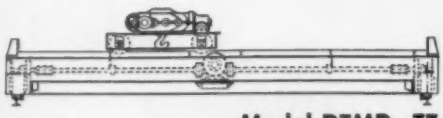
324 **Motor Buying Tips**—Bulletins GEC-1026A and GEC 1027A, each 11 pp, give buying information on a selected group of this manufacturer's motors. Included are application data, ratings and prices for fractional horsepower motors, integral-horsepower polyphase and single phase induction motors, motors and control for part winding starting, gearmotors and resilient-base integral-horsepower induction motors. General Electric Co.

325 **Variable Speed Motors**—Sixteen pp Bulletin 1797, revised, outlines many reasons why variable speed motors can be used to improve production, and it includes illustrations of all types of company's Varidrive motors, as well as their mechanical features, remote controls; etc. U. S. Electrical Motors, Inc.

326 **Motors, Brakes, Transformers**—Bulletin G-55-2, 8-pp, outlines advantages of company's line of motors, brakes and transformers. Describes applications, construction features, and lists rating data. Wagner Electric Corp.

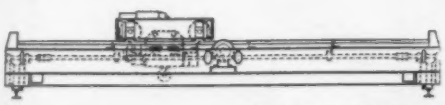
327 **Motor Speed Controls**—Eight-pp Form 927A features motor speed controls for adjustable-speed operation of d-c motors from a-c lines. Applications and advantages are listed,

STANDARD HEADROOM
Provides highest hook height with top-running trolley and foot mounted hoisting unit.



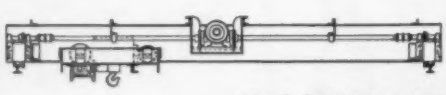
Model DTMD—TT

MEDIUM HEADROOM
Here the hoisting unit is rigidly suspended from the top-running trolley to reduce clearance over rail.



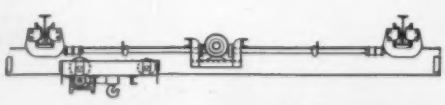
Model DTMD—LT

LOW HEADROOM
Under-running trolley permits unusually high hook lift. Use it where clearance under bridge must be maximum.



Model DTMD—UT

SUSPENDED TRACK
Operates on lower flange of crane runway suspended from roof guiders or other overhead support. Use also where load transfer is desired.



Model DUMD—UT

there is a
CRANEMASTER
for any building condition

Send For **BULLETIN C-101**

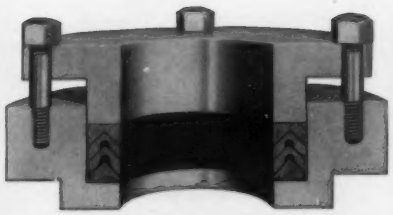
Describes in detail the many design and operating advantages of CRANEMASTER overhead traveling cranes. Also explains how Abell-Howe provides competent service from original survey to final installation.

ABELL-HOWE COMPANY 7747 Van Buren Street • Forest Park, Illinois

For more facts circle 645 on Reply Card

ONE OF THE GARLOCK 2,000

Why Garlock CHEVRON* Packing is really Automatic



This design is entirely different from ordinary V-type packings. CHEVRON has an exclusive hinge-like construction, assuring the automatic action for which it is designed. This also permits the use of less packing in shallower stuffing boxes.

The unique construction of Garlock CHEVRON permits free operation of rods or plungers at all pressures. As pressures increase the packing automatically tightens to prevent leakages. As pressures decline the CHEVRON Rings instantly ease off permitting free operation without leakage.

Therefore, after you make initial adjustment of the gland, no further adjustments are needed to compensate for variations in pressures.

Exclusive CHEVRON is one more part of "the famous Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals for every need—the only complete line. That is why you get *unbiased* recommendations from your Garlock representative. Call him today or write for CHEVRON Folder AD-115.

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GARLOCK

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G-E Hook-on Volt-Ammeter Helps Avoid Reading Errors

RANGE AND SCALE of this G-E instrument show simultaneously by simply turning the fingertip control knob. Seeing only one range and scale avoids reading errors.

SCREW-IN VOLTAGE LEADS and recessed terminals provide maximum protection for the operator. Voltage leads cannot be pulled out accidentally.

WIDE RANGES ARE AVAILABLE in both models of the G-E hook-on volt-ammeter. Ranges of the AK-4 model are 0-10/30/100/300/800 amperes and 0-150/300/750 volts. The AK-5 ranges are 0-5/20/80/-350 amperes and 0-150/300/750 volts. The wider range AK-4 model has a pointer-stop for accurate checking of surge readings.

FOR FURTHER INFORMATION, write Section 582-20, General Electric Co., Schenectady 5, New York and ask for bulletin GEA-6292, or contact your nearest G-E Apparatus Sales Office or Distributor.

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 647 on Reply Card

DATA FILE

(Begins on page 208)

operating principle is detailed, and specification, price and dimensional data are included. General Radio Co.

328 FHP Manual Starters—Bulletin 224 is a folder giving the features and ratings of a line of fractional horsepower manual starters. Lists applications for them. Square D Co.

329 Motor Controls—In the 86-pp Controlog are cataloged a variety of motor controls including starters, control centers, contactors, relays, switches, and accessories. Fully illustrated with photos and dimensional drawings, gives applications and descriptive information on each class, and includes prices and ordering data. General engineering data for estimating purposes included. The Clark Controller Co.

330 What You Should Know About Circuit Breakers—Sixteen-pp Manual 101 explains operating principles of basic circuit breaker designs and provides engineering data on factors of application. Includes simplified diagrams of three basic types. Illustrates with colored charts and diagrams, explains temperature factors, inrush current effects, tripping and reset time. Heinemann Electric Co.

331 Enclosed Switches—Catalog 83, 28 pp, describes in detail enclosed switches for industrial applications. Included are general switches designed for use on either a-c or d-c purpose switches, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches, all of which are available in a variety of actuator designs, contact arrangements and electrical ratings. Photos, dimensional drawings, circuit diagrams, electrical data are included. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

332 Low Voltage Switchgear—Twelve-pp Bulletin 6004B presents low voltage switchgear of the metal-enclosed, drawout type for indoor and outdoor installation using Types K and LG air circuit breakers. Design and construction details are explained and illustrated and emphasis is placed on safety advantages afforded by test position with door closed. General specifications and standard frame arrangements given. I-T-E Circuit Breaker Co.

334 Panel Components—Bulletin EE-120 is a 54-pp panel builders handbook of electrical components, containing specifications, diagrams, dimensions, photos and price lists of company's motor control. Profusely illustrated with photos, dimensional and wiring diagrams, bulletin covers manual starters, relays and contactors, magnetic starters in non-reversing, reversing, and multi-speed types, and a group of accessories which include thermal overload relays, oil tight pushbutton units, limit switches, timing devices, solenoids, electrical interlocks, and solenoid-operated brakes. Cutler-Hammer, Inc.

335 Aluminum Conduit Fittings—To fulfill the need for electrical equipment made of materials which resist corrosive attack of many chemicals destructive to ferrous or standard aluminum equipment, Bulletin 2681 presents a broad selection of Condulets and related equipment utilizing copper-free aluminum alloy in their construction. It includes Condulets, lighting fixtures, plugs and receptacles and others for both hazardous and non-hazardous locations. Book provides a pictorial-descriptive index plus full catalog listings, prices. Crouse-Hinds Co.

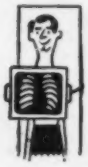
336 Electrical Conduit—This 8-pp bulletin, Form 646, describes company's heavy-duty, rigid steel electrical conduit, reproducing test data sheets to show how the protected conduit stands up under corrosive attacks of salt spray, sulfuric acid, caustic acid, and exposure to excessive heat. Four-color photos illustrate the effects on this and other conduit after exposure to attacks listed above. National Electric Products Corp.

337 For High Voltage Cable—Test results and service records on an improved butyl rubber compound for high-voltage cables are announced in 12-pp Bulletin EB-27. Covers resistance to ozone, operating temperature, high-voltage, dielectric strength, aging, insulation resistance, mechanical moisture absorption, electrical moisture absorption, capacity and power factor. Diagrams, charts and tables amplify text. Anaconda Wire & Cable Co.

5 Helpful Heart Facts

1 Some forms of heart disease can be prevented . . . a few can be cured.

2 All heart cases can be cured for best if diagnosed early.



3 Almost every heart condition can be helped by proper treatment.

4 Most heart patients can keep on working—very often at the same job.

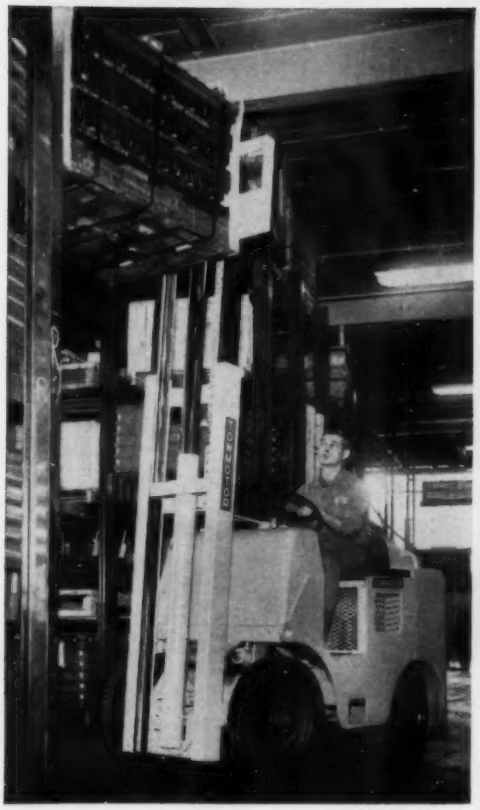
5 Your "symptoms" may or may not mean heart disease. Don't guess—don't worry. See your doctor and be sure.

FIGHT FEAR WITH FACTS

Help Your Heart Fund.

Help Your Heart

B.F.Goodrich



All-surface traction is a big feature of the new All-Purpose pneumatic industrial tire. The tread is wide, with a continuous center rib, husky shoulders and hundreds of strong gripping edges.

Strength and stability of the new All-Purpose pneumatic industrial tire give it capacity for heavy loads (left). Tires are more stable when heavy or awkward loads must be lifted or lowered.

New All-Purpose pneumatic industrial tire combines strength, stability and traction

THE new B.F.Goodrich All-Purpose pneumatic tire has a wide, husky tread with hundreds of gripping edges that provide positive traction, forward or reverse, on all types of surfaces. Because it's a pneumatic tire, it gives a quiet, cushioned ride that reduces driver fatigue and in-shop noise.

The body of the new All-Purpose is stronger, too. Continuous center rib and huskier shoulders help make the tire more stable under heavy loads. Tread wear is longer, more even. For outstanding versatility on all kinds of materials handling work, specify B.F.Goodrich All-Purpose pneumatic industrial tires.

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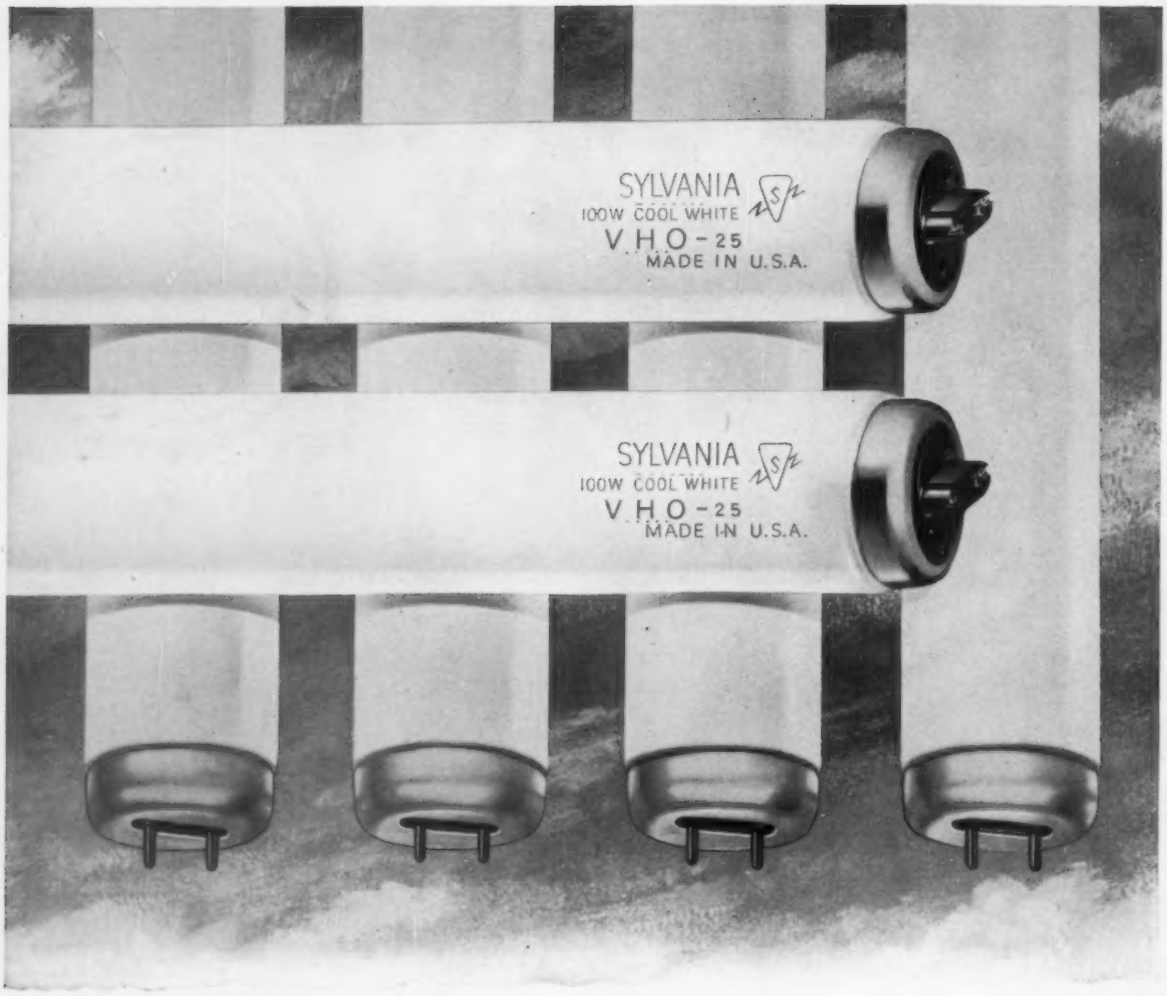

The new brighter pair that beats 4 of a kind!

Sylvania's newly developed VHO (Very High Output) fluorescent lamp is the result of a revolutionary design concept that makes possible more light per foot from fluorescent lamps.

The new VHO-25, for example, is a standard 4-foot, T-12 lamp in appearance . . . yet it produces more than double the light output of 40-watt lamps made up to now. In fact it will require about *five* present 4-foot, 40-watt fluorescent lamps to equal the light output of just *two* 4-foot Sylvania VHO-25 lamps.

To make the VHO lamp a practical reality Sylvania engineers conquered heat and pressure—two major obstacles to more light per foot. They did this by developing and combining these vital features:

- **New "Pressure Control" Center creates "cool spots" at lamp ends where mercury can condense.**
- **Neon gas replaces Argon—provides greater efficiency at higher wattages.**
- **Use of standard T-12 bulb—permits maximum effective production and use of ultraviolet radiation in tube.**
- **Sylvania Rapid Start System—keeps filaments warm, encourages effective electronic emission at all times.**

This new Sylvania lamp improvement now makes High-Bay Industrial fluorescent lighting practical and economical. And because fewer fixtures are required, it may be used economically for Low-Bay lighting.

VHO lamps offer new opportunities for increased efficiency and economy in street lighting and other outdoor lighting applications such as store fronts, service stations, parking lots and other commercial and industrial areas.

For complete information, consult your local Sylvania Representative, or send today for your free folder about the new Sylvania VHO Lamp. Write to:

SYLVANIA ELECTRIC PRODUCTS INC.
Lighting Division, Dept. 7L-7002
60 Boston Street, Salem, Mass.
In Canada: Sylvania Electric Products (Canada) Ltd.
Shell Tower Building, Montreal

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American Louisiana Pipeline carrying natural gas 1000 miles from Louisiana to Michigan, was given the proven protection of coal-tar enamel coatings. Three different types of enamels were used on various sections: Bitumastic® No. 2 Enamel for application in mild climates, Bitumastic No. 70-B Enamel for application to portions subjected to colder weather, and Bitumastic Hi-Melt Enamel for hot sections of the line after compressor stations. There's a Bitumastic Enamel for every pipeline need, from hot-line coating to sub-zero conditions. Your Koppers representative will be glad to explain why coal-tar enamel is your best investment for long-lasting protection of underground pipelines.

Metal Buildings have longer useful life when they are protected against corrosion by Bitumastic coatings. This oil company warehouse was completely cleaned, then coated with a system using Bituplastic® No. 28, a sunlight-resistant coal-tar coating. Added life of the structure through this treatment is estimated at 10 years.

This New Bulletin outlining the useful scope of Bitumastic cold-applied protective coatings is now available. You'll find it a handy guide in the selection of corrosion-resistant coatings for your applications. For your copy, write: Koppers Company, Inc., Tar Products Div., 1450 Koppers Bldg., Dept. 115B, Pittsburgh 19, Pa.

how to
CUT CORROSION LOSSES
a report by Koppers Company, Inc.

W. F. Fair, Jr.
Corrosion Consultant

The two most recent reports in this monthly series have stressed the importance of good surface preparation and described methods used to clean metal surfaces prior to the application of protective coating systems. This report describes an experiment, conducted under service conditions, which illustrates striking differences in coating performance due solely to differences in surface preparation.

* * *

In 1952 speculation arose concerning the contribution of wash primer surface conditioners and of inhibitory pigmented primers, when used with coal tar coating systems. Dr. Joseph Bigos of the Steel Structures Painting Council, and editor of the Steel Structures Painting Manual, participated in the discussions, giving freely of his time and experience.

When it was decided to subject certain typical protective coating systems to an environment of known high corrosivity, two areas in the Koppers Coke Plant at Kearny, N. J., were selected. The location of this plant on tide water, fumes and "coke breeze" from adjacent ovens, saline condensation from the coke quenching, and seasonal temperature shocks assured rugged testing conditions.

The areas tested were an actifier tower and three oxide box tops, totaling nearly 5,000 sq. ft. of steel surface. Fourteen coating systems were applied in duplicate 2-foot-wide strips on the vertical actifier tower, after thorough sandblasting. Of the flat box top areas, half were cleaned by sandblasting and half by power wirebrushing, and the same fourteen coatings were applied on both of these differently cleaned areas.

Primers used were a conventional coal tar cutback, three wash primers, two epoxy red leads, two phenolics, four special proprietary formulations, and three experimental coal tar solutions. Barrier coats over primers were Bitumastic® No. 50, Bitumastic Super Service Black, and Bituplastic® No. 28. For comparison, unprimed sections received the same coatings. Bituplastic No. 28 was used to topcoat all areas.

* * *

At the end of only one year, all systems on the wire-brushed areas—both primed and unprimed—had blistered and soon showed universal disbonding. After two years, disbonding and undercutting on these areas had caused complete coating failure. Now, after more than three years, all the coating systems on the sandblasted areas—both primed and unprimed—are in perfect condition and show no signs of deterioration.

In such severe corrosion environments, it is obviously futile to consider any but the best surface preparation. Also, it must be concluded that priming cannot compensate for incomplete metal cleaning.

* * *

Our Technical Department makes semi-annual inspections of this continuing test. We'll be glad to notify you of these inspection tours if you would like to be present. Write Koppers Company, Inc., 1301 Koppers Building, Dept. 115B, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto, Ontario and Edmonton, Alberta.

KOPPERS

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COATINGS AND ENAMELS

For more facts circle 650 on Reply Card

Why Faucets Leak

Faucet washers, when fastened with TOO LONG or SHORT screws — as in "9 out of 10" replacements by best mechanics — quickly work loose, destroy themselves!

"SEXAUER" finds the answer—after 34 years research

Note Nylon plug — locks screws automatically

Note Fiberglas backing — resists closing squeeze

Now, NEW Pat'd. "Sexauer" SELF-LOCK screws, with expanding NYLON PLUG imbedded in the threads, fasten and *lock* at correct depths AUTOMATICALLY, hold faucet washer *firmly*. Made of rust and corrosion resisting Monel, heads won't twist off, screw slots won't distort; they can be used over and over.

When installed with NEW Pat'd. "Sexauer" EASY-TITE faucet washers, this combination outlasts past faucet repairs "6 to 1"!

EASY-TITES are made of super-tough, pliable duPont compound (neither rubber nor fibre) to withstand super-hot water and make tight even on worn, corroded seats. They are further *reinforced* with a vulcanized layer of Fiberglas to resist distortion and splitting from shut-off squeeze.

The hidden costs of faucet leaks!

As authenticated by Hackensack, N. J. Water Co. and American Gas Association, stopping just ONE pin-hole (1/32") size leak can *reduce* water waste 8,000 gal. monthly. Stopping a *hot water* faucet "drip" can result in water and fuel saving of over $7.58 QUARTERLY—plus material and labor costs and *costly* fixture replacements!

That's why thousands of Government Agencies, Housing Projects, Hospitals, Colleges, Schools, Manufacturers, Hotels, Realties and Utilities — country wide—look to "SEXAUER" Technicians skilled in plumbing maintenance know-how. They are trained to determine stock levels thru complete SURVEYS of actual fixtures in service and to install stock systems that avoid overstocking and shortages.

NEW SELF-LOCK SCREWS and EASY-TITE faucet washers are just part of the "SEXAUER" line of over 3000 TRIPLE-WEAR plumbing repair parts and Pat'd. precision tools.

A "SEXAUER" Technician in your vicinity will make our NEW, 126 pg. Catalog H available and gladly consult with you regarding your plumbing maintenance problems *without obligation*. Write today!

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WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

For more facts circle 651 on Reply Card

DATA FILE

(Begins on page 208)

338 **Electrical Wires, Cable**—Bulletin 1105, Section 1, 16 pp, features a cable selection chart and complete engineering information on company's line of electrical wire and cable. Advantages of the products are detailed, a table of insulations furnished, and design and construction features illustrated. The Okonite Co.

339 **Trolley Busway Systems**—Three bulletins offer real help on electrical installations involving cranes and hoists, assembly and production lines, moving test lines and other moving electrical equipment. Bulletin 35 (28 pp) covers 225-500 amp systems; Bulletin 50 (44 pp) 100 amp systems; Bulletin 45 (40 pp) 60 amp systems. Each includes special sections on installation planning and procedure, methods of mounting and descriptions and illustrations of equipment. Feedrail Corp.

340 **Asbestos Insulation**—"Specifications for Asbestos Varnished Cambric N.E.C. Type AVA Lighting Wire and Power Cables," 8 pp, establishes performance tests for asbestos insulation applied as a felted wall in combination with varnished cambric tapes for wires and cables with 600 and 1000 v ratings. Also measures plus values of the construction over and above industry standards. Standards for test characteristics, such as minimum permissible breakdown after initial dielectric test are covered. Rockbestos Products Corp.

341 **Battery Manual**—Battery selection techniques are emphasized in 20-pp Bulletin 210, a revised edition of this manufacturer's manual on storage batteries for stand-by power, emergency lighting and switchgear applications. A discussion of charging equipment and simplified battery maintenance procedures is included. Storage battery installation procedures are described and illustrated by photos. Exide Industrial Div., The Electric Storage Battery Co.

342 **Handbook on Storage Batteries**—This 64-pp booklet of instructions and technical data is the sixth edition of this company's battery service manual. Provides a brief treatise on the theory of the lead-acid battery. Gives detailed instruction on the care and operation of batteries, on maintenance and repairs, and on standard and special parts. Booklet is of special value to plant engineers concerned with storage batteries for cycle service in industrial trucks and materials handling equipment. Gould-National Batteries, Inc.

343 **Motive Power Batteries**—This 48-pp general service manual on lead acid batteries for all types of motive power application is a practical guide to industrial cycle service, including industrial truck, air conditioning, and others. Includes photos, charts, tables, methods of repair, maintenance and theory of operation, instructions covering repairs with regular or special tools, simplified testing methods, including safety practices, acid handling precautions, and charging methods. C. & D. Batteries, Inc.

LIGHTING

345 **Architectural Floodlighting** — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose heavy-duty floodlights. Also contains tips on floodlighting of vertical surfaces and discusses four "musts" of an efficient economical floodlighting installation. A table of recommended foot-candle levels for exteriors provided. General Electric Co.

346 **Fluorescent Lighting**—This 24-pp fluorescent lighting guide book is a reference digest on fluorescent products. Gives advantages of this type of lighting; summarizes various lamps and parts, including starter sockets, lampholders. Includes reference chart for lamp performance when interchanged with typical ballasts. Sylvania Electric Products Inc.

347 **Guides to Luminaires** — Pocket-size, 28-pp Bulletin B-5799-BB covers fluorescent luminaires for industrial and other use. Summarizes salient features of each type of luminaire as it discusses electrical characteristics, maintenance and mounting data, details of construction, dimensions, and recommendations for application. Also contains a pictorial guide to floodlights and incandescent luminaires for industrial and other use. A

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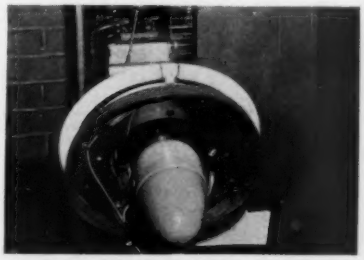
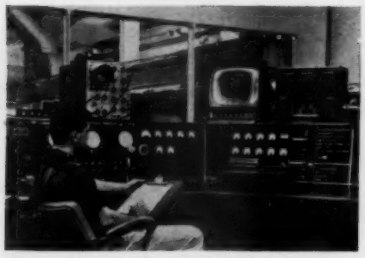
Quick record reference via *ii-TV* permits concentration of records in one area, saves this user $30,000 a year. GPL system is simple enough for anyone to operate.

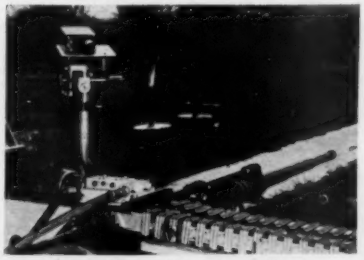
Hard-to-see actions, as in the bouncing under-chassis of GM cars in road test, *above*, can now be viewed. Standard GPL TV camera takes hard knocks in stride.



Monitoring distant meter saves this manufacturer substantial sums in electric bills by avoiding peak loads. Reliable, remotely located TV camera by GPL needs no tending.



Observer is safe when dangerous operations, like this one involving radiation at Brookhaven National Laboratory, are seen through sharp pictures of GPL camera.



Even bone-shattering concussions can't disturb perfect pictures of GPL's Ruggedized camera, designed specifically for most severe applications.

Basic *ii-TV* system is finest, most dependable; costs less than medium-priced car. Mobile GPL TV Projector gives wall-size pictures 300% brighter than any other.

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For further details, or demonstration of this precision-engineered system in your own office or plant by local GPL representative, write on your letterhead to Mr. N. M. Marshall, Sales Manager, General Precision Laboratory Incorporated, 61 Bedford Road, Pleasantville, N. Y.

*GPL's *industrial-institutional TV* system.

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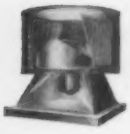

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DATA FILE

(Begins on page 208)

4-pp tabulation of buying data is provided. Westinghouse Electric Corp.

348 **For Emergency Lighting**—Catalog 10, 8 pp, offers technical data on equipment designed to promote instant automatic emergency lighting protection whenever the regular source of power fails. Includes automatically charged lighting units, types for hazardous areas, emergency power systems, exit lights, emergency light and hand lamps, lanterns, low voltage extensions. Electric Cord Co.

349 **Lamps for Industry**—Eight-pp Bulletin 66 presents manufacturer's line of lamps for industrial service, indoors and outdoors. These include mercury vapor lamps, weatherproof floodlights, high bay reflector lamps, spotlights, infra-red lamps, spatterproof lamps, and others. Illustrated with photos, curves indicating candlepower, brief text covers features and applications of each type. Radiant Lamp Corp.

TOOLS, WELDING, AND MACHINE SHOP EQUIPMENT

351 **Data for the Shop**—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals, drill grinding charts, twist drill sizes and other data. Standard Oil Co. (Ind.)

352 **Portable Electric Tools**—This standard catalog, Form 10, 24 pp, features portable electric tools, including electric drills, benchdrill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, saw blades, vacuum cleaners and others. Photos included. The Black & Decker Mfg. Co.

353 **Pipe Tool Ordering Guide**—Catalog 2-51, 8 pp, covers company's line of threaders, cutters, vises, dies, tongs and wrenches; gives prices. Armstrong Bros. Tool Co.

354 **On Spot Welding**—"Spot Welding from One Side—With a Portable Gun," 12 pp, describes an inert-gas-shielded tungsten-arc spot welding process. Over 30 tables, weld cross-section and application photos, drawings and graphs are included. Sections of text cover when to consider spot welding from one side, how the equipment operates, standards and test procedures, factors affecting weld. Air Reduction Sales Co., Div., Air Reduction Co., Inc.

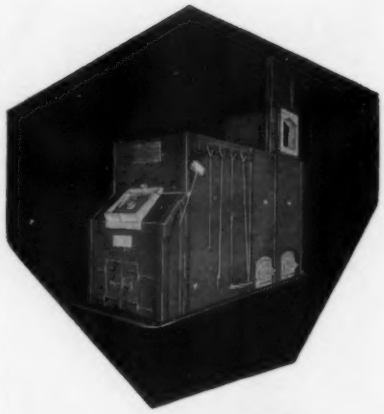
355 **Where to Use Your Stud Driver**—Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel and steel into steel, as well as their use for attachment of pre-drilled fixtures. Remington Arms Co., Inc.

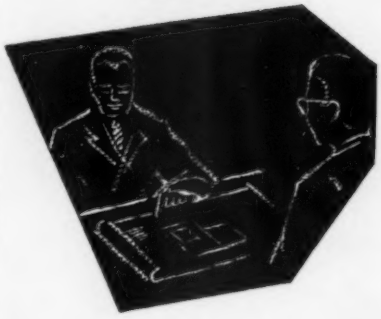
VALVES, TRAPS, PIPING AND ACCESSORIES

357 **Bronze Valves**—Globe and angle bronze valves with rising stems, union bonnets and stainless steel plug type seats and discs are described in this bulletin. Discusses design advantages, gives dimensions. The Walworth Co.

358 **Diaphragm Valves**—Catalog V-55, 34 pp, covers operation, installation and selection of diaphragm valves for handling of acids, alkalis, gases, volatile and viscous substances, water and other fluids, compressed air vacuum, slurries, semi-solids, beverages and food products. Diaphragm materials are described, selection tables included. Hills-McCanna Co.

359 **Lubricated Plug Valves**—Catalog PV-4, 36 pp, shows in detail a line of iron and steel lubricated plug valves. Many illustrations of single, screwed and bolted gland type valves are shown, including photos, sectional and detailed drawings. Also included is physical data on dimensions, ratings. The Wm. Powell Co.





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DATA FILE

(Begins on page 208)

360 **Valve Performance Facts** — Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Industries include paper mills, refineries, central stations, other plants. Crane Co.

361 **High Pressure Valves**—Bulletin B-451, 12 pp, contains complete engineering data on company's valves for high pressure and high temperatures. Typical installations are pictured, dimensions and weights are tabulated, and temperature-pressure ratings are shown. A selection table is included, as well as information on materials, design. Yarnall-Waring Co.

362 **Valve Data**—This loose-leaf notebook contains a collection of company's bulletins on its line of valves for control of air, gas, liquids and solids. It features complete operating, design, dimensional and specification data on butterfly, slide, automatic and proportioning valves, and is profusely illustrated with photos, drawings and diagrams highlighting valve design. W. S. Rockwell Co.

363 **Plug-Type Valves**—Long-life features of company's stainless steel plug-type valves are stressed in 6-pp Form 202-A. Cutaway view illustrates important design and operation features, and tables list sizes and dimensions. Jenkins Bros.

364 **Corrosion Resistant Valves**—Monel and nickel corrosion-resistant valves are described in Bulletin 9. Discusses corrosion-resistant properties of Monel and nickel, listing specific application for which each is suited. Gives casting composition of both alloys and describes their mechanical properties. Cross-sectional illustrations of gate, globe and check-type valves are included. Alloy Steel Products Co.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 205 and 206.

366 **Steam Trap Book**—Catalog J is a 44-pp manual and ordering guide in which 17 pp are devoted to data on fundamentals of good trapping and trap selection. Installation and maintenance instructions are also provided. Book lists steam traps for maximum pressures of 250, 600, 900, 1500 and 2500 psig. Included, also, is a section on trouble shooting. Armstrong Machine Works.

367 **Steam, Air and Gasoline Traps**—Catalog 751, 32 pp, is a trap ordering book with capacity tables, installation diagrams, and containing charts and formulas for determining proper size trap for specific applications. Covers thermostatic steam traps, expansion steam traps, weight-operated traps for steam, air, gasoline, pressure up to 1500 lb. W. H. Nicholson & Co.

368 **Unions, Check Valves**—Illustrated Catalog 55, 24 pp, describes and provides ordering information on a line of forged steel unions and check valves. Socket-weld, high-speed, orifice, O-ring and other unions are included. Catalog provides service recommendations, dimensions and list prices. Also included is table covering discharge of water to atmosphere. Clayton Mark & Co.

369 **Improved Hose Coupling**—A quick connect-disconnect hose coupling for water, oil, steam, gas and chemical lines is described in this 16-pp bulletin. Describes the coupling's construction and explains how it provides a sealing action which makes the coupling tighter as internal pressure increases, and a full swiveling action that prevents hose twisting and kinking. Titeflex, Inc.

370 **PVC Pipe Fittings, Flanges**—This is a comprehensive 12-pp catalog on corrosion resistant pipe fittings and flanges in normal- and high-impact grades, rigid, unplasticized polyvinyl chloride. Shows characteristics, ad-

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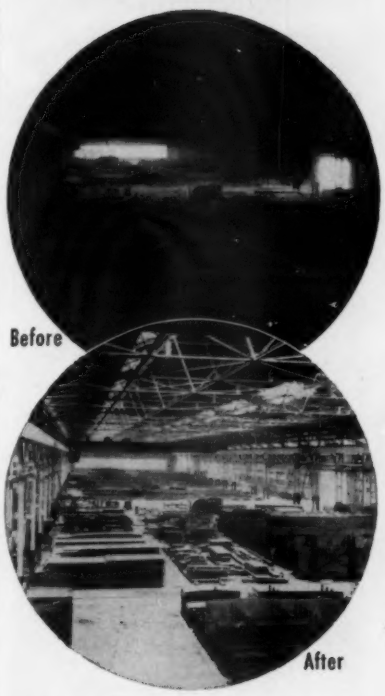

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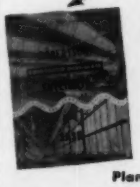

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(Begins on page 208)

vantages and limitations. Lists operating pressures, temperatures, applications, price comparisons, fabrication advice, installation and supporting recommendations, dimensions and weights. Grinnell Co., Inc.

371 **Pipe for Modern Buildings**—This 16-pp booklet discusses wrought iron pipe for modern buildings. Identifies wrought iron pipe and describes composition and advantages. Included are sections on wrought iron's resistance to corrosion and fatigue stresses, weldability, forming and threading, as well as the application of protective coatings to the material. Pictures illustrate applications. A. M. Byers Co.

372 **Bellows Design Guide**—Twenty-pp Catalog 155 contains helpful information on applications, design considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Tables supplement text. Flexonics Corp.

373 **Fittings and Tubing**—Steel and zinc coated fittings and tubing are described in illustrated bulletin SF-155. Advantages are detailed and installation diagrams are included. U. S. Hoffman Machinery Corp.

INSULATION

374 **Piping Insulation** — Seven-pp Bulletin SO 1054 features a snap-on, one-piece molded pipe insulation of fine glass fibers for hot or cold piping. Specifications are given for industrial, commercial, and institutional piping where maximum efficiency is of primary importance and for hot water and low pressure steam. Gustin-Bacon Mfg. Co.

375 **Pipe Insulation**—Bulletin F 1-100 features on-the-job installation photographs of cellular glass insulation for pipe temperatures between—300 and 800 F. Complete listing of physical properties, condensed specifications are given. Pittsburgh Corning Corp.

PUMPS, COMPRESSORS

377 **Circulating Pump**—Bulletin 1A-856 details seven advantages of company's Booster circulating pumps, and includes complete design and performance information. A capacity chart and specifications included. Bell & Gossett Co.

378 **Condensed Pump Data** — Form 4383-J covers more than 20 types of general service pumps, rotary pumps, sump and drainage pumps, condensate units, self-priming units, stainless steel pumps and high-pressure pumps. In easy-to-find tabular form, each model is pictured along with its characteristics, applications and features. Goulds Pumps, Inc.

379 **General Purpose Pumps**—Section B, 36 pp, describes rotary pumps for general purpose use. Explains positive displacement principle incorporated, gives suggestions for selecting proper materials of construction. Application and ordering information is provided on mounted and unmounted small pumps, large mounted pumps, pumps for operations requiring greater sealing, and large, totally enclosed models. An engineering section covers recommended speeds and capacities. Viking Pump Co.

380 **Solids Handling**—Bulletin 121-A, 8 pp, describes non-clog pumps for handling solids in suspension. Included are vertical, horizontal and close-coupled types used to handle liquid components of industrial processes, industrial waste, and for such pumping applications as water supply, drainage and sewage handling. Specifications are included. Aurora Pump Div., The New York Air Brake Co.

381 **Continuous Flow Pump**—Bulletin 30-C, 8 pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, and includes photos, diagrams and specifications. Robbins & Myers, Inc.

382 **Industrial Compressors**—Bulletin SSB-56 covers company's complete line of industrial

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Extra, for no cost, you get drier compressed gas or air for your process. You get better operation and lower costs in the use of all air-operated instruments, machines, or paint sprays. You save expense for piping, pumping, water treatment and disposal. You get the use of badly needed water elsewhere in your plant.

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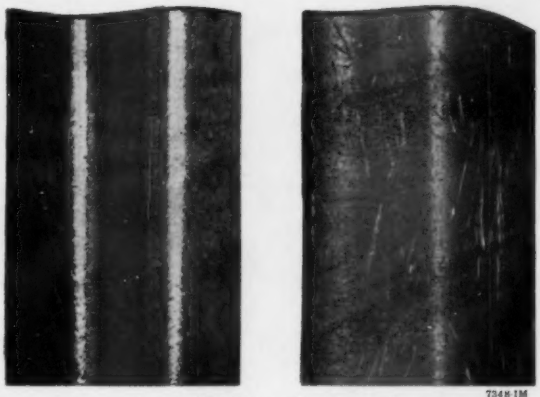

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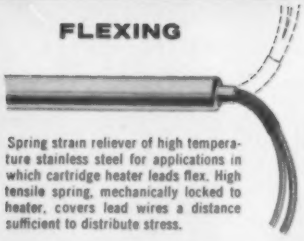

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Moisture-resistant flexible brass conduit protects lead wires of cartridge heaters operating in presence of steam, water, oil and vapors. Also offers added protection from flexing, vibration and mechanical damage.

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Flexible brass conduit protects cartridge heater lead wires against abrasion from other moving parts and from accidental mechanical damage. Safety factor where lead wires are exposed to machine operator.

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DATA FILE

(Begins on page 208)

air compressors from the 1/2 hp to 150 hp, including the accessories that go to make a complete installation. Photos of the various models are included, as well as specifications and dimensions. Schramm, Inc.

383 **Air Compressors**—Bulletin A-62, 20 pp, covers construction, operation information on company's class WN-112 heavy-duty air compressors. Illustrates five models of compressor, for displacement capacities from 368 to 974 cfm at sea level, and four high altitude models for 532 to 1106 cfm. Joy Mfg. Co.

384 **Portable Compressors**—Twelve-pp Catalog GG-9A pictures 40 models of company's portable type compressors. A quick reference chart shows capacities, engine types, and mountings available. Illustrates such features as: replaceable cylinder sleeves, interchangeable valve parts, aircraft type compressor cylinders, heavy duty industrial type engines, and magneto ignition on all gasoline models. Le Roi Div., Westinghouse Air Brake Co.

385 **Gas-Engine Driven Compressors**—A two-cycle turbocharged compressor is described in 24-pp Bulletin 134. Stresses economy of installation and operation afforded by this gas-engine driven unit, lists other advantages. Explains how turbocharging saves on fuel and cooling. Design and construction features are discussed. Clark Bros. Co.

386 **For On-the-Spot Air**—Eight-pp Form 2302 features company's self-contained Spot-Air portable compressor. Deals with the many tools it will operate, with actual on-the-job illustrations pointing out added advantages of this light-weight compressor on jobs where bigger compressors are not needed. Ingersoll-Rand Co.

FILTERING

388 **Filters, Strainers**—Industrial Catalog 1054, 48 pp, provides application and engineering information on company's line of microfilters and precision strainers. Fuel filters, full flow and by-pass lube filters, air separators, and metal edge strainers for fuel lube and industrial use are presented along with construction details, performance data, and specifications. Purolator Products, Inc.

389 **Filter Fabric Facts**—This 16-pp illustrated booklet contains information about filtration principles; filtering devices; filter media; textile fabrics for filtration; a comprehensive chart on chemical and heat resistance of cotton and synthetic fabrics; sections on yarns, fabrics construction and finishing; and a round-up of filter fabrics in use. Wellington Sears Co.

INSTRUMENTS, CONTROLS

391 **Service Regulators**—Revised Bulletin 1026, 20 pp, features company's line of service regulators. Rate-of-flow graphs illustrate mathematically the determination of maximum outlet pressure build-up and amount of gas relieved to atmosphere by extra safety device in case of failure of regulator. Rockwell Mfg. Co.

392 **Versatile Electronics**—How flexibility of electronic temperature controls makes them useful in a wide range of heating and air conditioning installations is explained in this 16-pp booklet, Bulletin SA-2681. Purpose of publication is to fill the gap between the theory of electronic bridge circuits and specific control layouts and circuit diagrams. Four basic features that give electronic control its flexibility and broad application are described. Minneapolis-Honeywell Regulator Co.

393 **Temperature Controls**—Eight-pp Catalog CC, on temperature controls and allied equipment for heating and refrigeration, provides information on recording, indicating, nonindicating controls; thermometers; bulb installation accessories; process timers, and gas pilots. Includes prices and references to detailed literature. The Partlow Corp.

394 **Thermostatic Shower Control**—Safety advantages of the Hydroguard thermostatic

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Thread 1" to 2" pipe...

WITH POWER

This light (26 lb.) compactPortablePower Pipe Threader, goes to the job—is operated with a ½" portable electric drill. 1 set of High Speed Steel Chasers do all sizes—just move indicator to 1", 1¼", 1½", or 2" marking. Clamp on pipe and apply drill to drive square. The rest is automatic. Operating on anti-friction bearings with automatic lead, it's a fast, easy way to get smooth, accurate threads.

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BLAST HEATERS
RADIATORS

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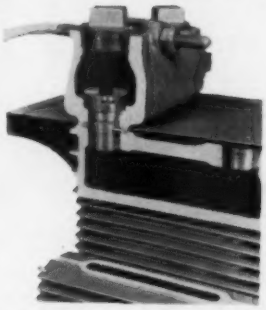

Corrosion in unit heaters—external, from contaminated air . . . internal, from electrolytic action ENDS—when your unit heaters are GRID cast iron construction, here's why—GRID heating sections are made of high-test cast iron . . . no external corrosion from acid or other fumes present in many plants.

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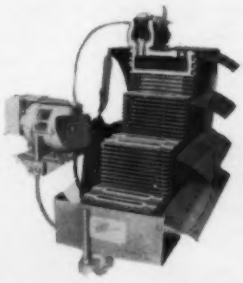
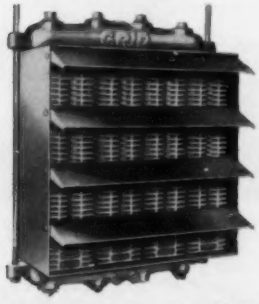


GRID design gives you maximum heating performance because—GRID provides more air changes at lower outlet temperatures . . . carefully selected motor speeds and fan capacities positively deliver warm, comfortable air in ample volume to floor level . . . no wasted heat through stratification.



TROUBLE FREE HEATING SERVICE SINCE 1929

GRID installations save you money as GRID requires no maintenance . . . is practically self-cleaning (note wide fin spacing in illustration). GRID provides long service life . . . units installed in 1929 are still operating. No ordinary unit heater approaches GRID's record for continuous trouble-free heating service.

Get the complete story on GRID Unit Heaters, GRID Blast Heaters and GRID Radiation for industrial plant use. Write for your copy today.

D. J. MURRAY MANUFACTURING CO.

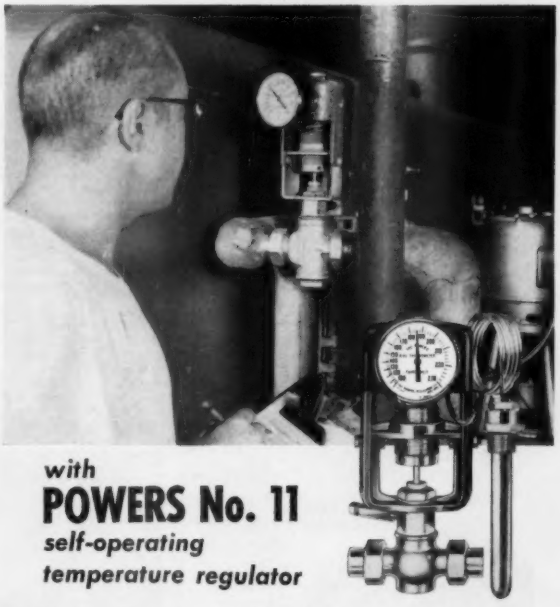
Manufacturers Since 1883

WAUSAU, WISCONSIN

For more facts circle 665 on Reply Card

VISIBLE PROOF

of constant temperature control



with

POWERS No. 11

self-operating temperature regulator

This big four-inch dial gives a quick, visual means of checking controlled temperatures . . . an accurate guide for regulator adjustment.

Designed for precise temperature control, the Powers No. 11 Regulator is self-powered...simple, compact and dependable. Full throttling action is gained without the aid of *any* external power source. Special valve stem lubricator eliminates binding. Big double ply metal bellows provide extra valve power — longer life. Union body assures easy installation.

For specifications, valve sizes, types and temperature ranges, call your Powers branch office — engineering services in 66 cities. Write for Bulletins Nos. 329 and 330. ***The Powers Regulator Company, Skokie 23, Illinois***

POWERS

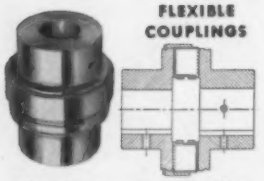
TEMPERATURE CONTROL

For more facts circle 666 on Reply Card

Lovejoy

POWER TRANSMISSION EQUIPMENT

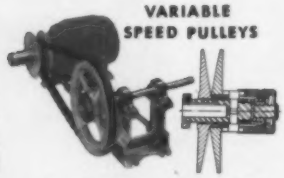
EASILY INSTALLED, MAINTENANCE-FREE



FLEXIBLE COUPLINGS

REQUEST BULLETIN C56

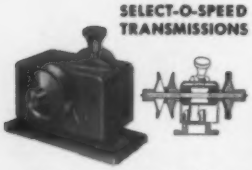
Bores (max.).....⅝" to 9½"
O.D. .....⅝" to 21½"
Wt. .....½ oz. to 1500 lb.
H.P. .....1/20 to 3000
Torque (static).1½ to 5100 ft.-lbs.



VARIABLE SPEED PULLEYS

REQUEST BULLETIN 118

Bores (max.).....½" to 1⅝"
O.D. .....3" to 13⅜"
Belt Sizes.....A to 2¾ TW
Speed Ratios.....1-1 to 8-1
H.P. (1750 rpm.).....¼ to 15



SELECT-O-SPEED TRANSMISSIONS

REQUEST BULLETIN 118

Controls.....Lever or Hand Wheel
Belt Sizes.....A to C
Speed Ratios.....1-1 to 10-1
H.P. (1750 rpm.).....½ to 7½

UNIVERSAL JOINTS

REQUEST BULLETIN 820

Bores.....¼" to 2"
Hub Dia. .....½" to 4"
Static Torque
340 to 130700 in.-lbs.
H.P. (100 rpm.).....½ to 207

Ask Lovejoy to recommend the exact equipment for your application. No obligation. Request catalog.

LOVEJOY FLEXIBLE COUPLING CO.
4888 WEST LAKE STREET • CHICAGO 44, ILLINOIS
For more facts circle 667 on Reply Card

DATA FILE

(Begins on page 208)

controls for showers are outlined in illustrated Bulletin 366. Design and construction details are shown, capacity, and applications in industrial plants and institutions cited. The Powers Regulator Co.

395 **Scale Selection**—A variety of scales are presented in Catalog 651. Contains complete technical information on dormant platform, portable and bench scales. Also describes and illustrates meat packing, motor truck and dairy type scales. Introduces a heavy-duty scale with air-controlled filling device which measures light or heavy oils, chemicals, paints, varnishes, syrups and other liquids at the touch of a button. Detecto Scales Inc.

SPACE, PROCESS HEATING

397 **Plumbing, Heating Supplies—Edition H** is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and generously illustrated; gives sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

398 **On Unit Heaters**—Latest improvements, specifications and performance data for Herman Nelson horizontal and vertical unit heaters are covered in 36-pp Bulletin 700A. Includes complete hot water and steam performance tables, dimensions, selections, applications, descriptions of cabinets, elements, motor mountings, fans and accessories, controls. Also provided are suggested layouts, piping diagrams, other data. American Air Filter Co., Inc.

399 **Revolving Unit Heaters**—Bulletin HR-6A, 16 pp, features revolving unit heaters for industrial plant heating, presenting design and construction details and showing typical installations. Engineering data, mounting heights and coverage, and dimensions are tabulated, and dimension drawings are included, along with installation planning tips and specifications. L. J. Wing Mfg. Co.

400 **Industrial Ovens**—Engineering, manufacturing and installation of processing ovens are described in Bulletin D-53-20, 16 pp. Covers oven types, application to industry source of heat, selection of heater, control of heat, distribution of heat. Photos show typical oven installations, and a complete modern finishing process is presented. Newcomb-Detroit Co.

401 **Electric Heat, 101 Ways**—Principal industrial heating applications and methods are described in "101 Ways to Apply Electric Heat," a 32-pp booklet. Illustrated case histories show how metal-sheathed electric heating units are being used. Physical aspects of installation are detailed along with a discussion of the problem, solution and advantages obtained. To illustrate liquid heating, diagrams and photos show best applications for the elements and heaters. Similar treatment is accorded problems of heating air and gases; melting soft metals and viscous materials; and heating machinery and equipment parts. A section is devoted to far-infrared heating. Edwin L. Wiegand Co.

402 **Industrial Ovens**—Thirteen types of company's Conventioneered ovens, which apply principles of forced convection heating to various industrial processes, are illustrated and described in 12-pp Bulletin 200. These ovens serve foundries, metal finishers, plastics producers. The W. W. Sly Mfg. Co.

PACKINGS, GASKETS, SEALS

404 **Teflon Products**—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packing, Teflon impregnated asbestos packing, V-type packing and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

Self-Dumping Hoppers speed hot ingot handling

"Our Roura Hoppers are vitally important to us. They help keep production moving and are almost never out of service," says Sol Rubin of North Chicago Refiners & Smelters, Inc. Fifty heavy duty Roura Self-Dumping Hoppers, reinforced to prevent warping under high heat, carry hot ingots of brass or bronze from melting furnace to storage or direct to trucks or cars. Roura Hoppers are also used to transport scrap from cars to bins. One man with a standard lift truck picks up a full Hopper, carries it to its destination, flips the latch, and the Hopper dumps its load automatically, rights itself, locks itself.

Roura Self-Dumping Hoppers are cutting costs throughout industry handling wet or dry, hot or cold bulk materials.

ROURA *Self-Dumping* HOPPER

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1413 Woodland Ave., Detroit, Michigan

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For Low-Cost Heating Plant Exhausting and Industrial Venting ...Investigate *Quickdraft*

Capacities of 56 standard and heavy duty models (6 to 30-inches diameter) . . . 140 CFM to 16,766 CFM with or without stacks. Greater capacities on special order.

★ NEW ACID-RESISTING FINISHES
★ NO FAN OBSTRUCTION IN EXHAUST LINE
★ BLOWER OPERATES IN CLEAN OR OUTSIDE AIR
★ CAN BE USED WITH OR WITHOUT STACK

FOR HEATING PLANTS AND INCINERATORS. Quickdraft provides constant draft required for efficient and economical combustion. It prevents noxious concentrations of deadly fumes and dangerous accumulations of explosive gases from escaping into buildings. It eliminates pulsating or chattering, puffing, smoking and sooting. Quickdraft's acid-resisting vitreous enamel finish assures trouble-free performance.

FOR INDUSTRIAL VENTING. Quickdraft eliminates down-time for cleaning and replacing fan blades . . . cuts maintenance costs. It is ideal for venting paint booths . . . abrasives, corrosive gases, noxious fumes, high temperatures and moisture. For severe exposure to acids, specify our new acid-resisting plastic finish in addition to our standard acid-resisting vitreous enamel finish.

FOR MOVING AIR . . . in or out of buildings through ducts . . . Quickdraft is outstanding in efficiency.

Send for engineering data on your heating or venting applications . . . today.

See our display Booth 717 INTERNATIONAL HEATING AND AIR CONDITIONING EXPOSITION Chicago... February 25 to March 1, 1957

N-394-QD

Quickdraft COMPANY

Dueber-Hampden Building, P. O. Box 87-P, Canton 1, Ohio

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Launcelot's Sitting Pretty

"Forsooth," quothes Sir Launcelot (ye Smart Buyer of Industrial Furniture), "methinks *Royal* bids fair to convert ye whole world to ye use of goode factory seating.

"Exceeding function with comfort doth add zest to endeavor . . . prolong aptness, alertness . . . out-bounty ye fabled 'king's ransom'."

Yes, *Royal* Adjustable Chairs and Stools bring to the assembly table, drafting room, factory office, and production machine a complete array of sturdy steel seating designed by correct-posture specialists.

Thy most stalwart Knight . . . thy fairest Maiden . . . thy Earl of Exchequer (ye Prince of ye Pocketbook) . . . all will applaud fatigue-free *Royal* Seating. Each piece is a crowning achievement.

For the world's finest industrial chairs and stools—for wardrobes, cabinets, machine stands, foreman's desks, and efficient vertical files—see your *Royal* Dealer, or mail ye coupon nowe!

Model 515 Model 625 Model 535 Model 624 Model 511

ROYAL METAL MANUFACTURING COMPANY
175 N. Michigan Ave., Chicago 1, Ill., Dept. 28-C

Please send me free 24-page Catalog No. 7001, "*Royal* Seating for Modern Industry;" Complete information on *Royal* Verti-File Vertical Filing.

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Company_____

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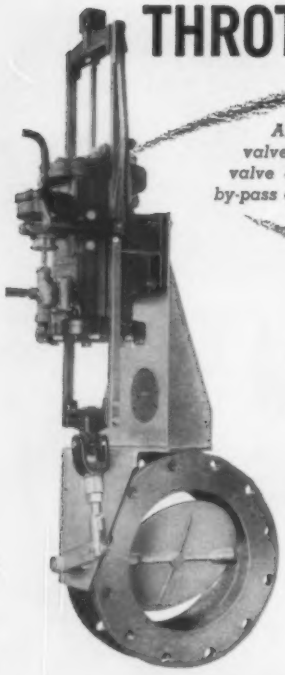
THROTTLES HOT GASES



All stainless steel 10" butterfly valve, with air cylinder operator and valve disc positioner, for throttling by-pass gases at 1200°F.

This is but one of many W. S. Rockwell standard and special flanged butterfly and wafer butterfly valves that meet any condition of pressure, temperature, corrosion or abrasion. Made in sizes from 4" to 144" of any metal, rubber-covered synthetic resin or glass-coated metal. For regulating, throttling or shut-off of air, gases, liquids or solids, no matter how "tough" the operating conditions. Minimum pressure drop. Non-clogging. Self-cleaning. Furnished with any manual or automatic operators. Write for Catalog.

W. S. ROCKWELL
Butterfly Valves
W. S. ROCKWELL COMPANY

ROCKWELL SINCE 1888 BUILT

BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

2927 ELIOT STREET • FAIRFIELD, CONN.

Sales Representatives in Principal Cities

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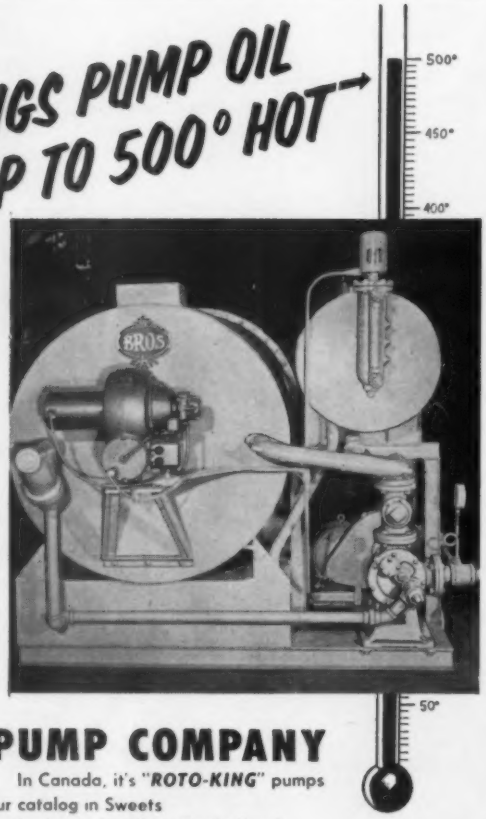
HOW VIKINGS PUMP OIL UP TO 500° HOT



By use of two Vikings, a positive, constant flow of hot oil is pumped through this Bros hot oil heater, providing accurate control of the high temperature—up to 500° F.

Built by Wm. Bros Boiler and Mfg. Co., Minneapolis, Minn., the unit is widely used in highway construction, lumber and paper mills, paint plants, soap factories and many other industries.

You, too, will find Vikings ideal pumps for positive and smooth delivery of liquids. For information, write for Bulletin 57Sz.

VIKING PUMP COMPANY

Cedar Falls, Iowa, U S A In Canada, it's "***ROTO-KING***" pumps

See our catalog in Sweets

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DATA FILE

(Begins on page 206)

405 **Packings for Chemicals**—Dura Plastic Teflon packing for sealing applications in the handling of corrosive chemicals is introduced in Bulletin 461 M.D. Stresses heat resistance of the material, chemical inertness. Discusses construction details and lists packings for use with specific chemicals. Durametallic Corp.

MATERIALS HANDLING

407 **Electric Hoists**—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data, specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

408 **Overhead Cranes**—Bulletin T202, 20 pp, gives full information on top running double girder cranes with top running trolley in capacities from 2 to 12 tons, spans to 60 ft. Data is also given on top running single girder cranes, both motor driven bridge types and head geared or push type in capacities from 1 to 10 tons, spans to 50 ft. Features which contribute to efficient operation and low maintenance costs are detailed. Electrical information included. Chicago Tramrail Corp.

409 **Transit Crane**—Twelve-pp Bulletin 15-B-TC-1 describes a transit crane of 15-ton capacity. Illustrated by job application photos and closeups of mechanical features, the booklet includes a list of specifications and working ranges, plus brief, easy-to-read description of the machines, advantages. Bucyrus-Erie Co.

410 **Overhead Dispatch System**—Form F 192, 8 pp, describes an automatic overhead dispatch system designed to solve a variety of materials handling problems. Outstanding advantages are listed and typical installations are described and illustrated with detailed diagrams. Component equipment utilized in this system is individually illustrated and described. Richards-Wilcox Mfg. Co.

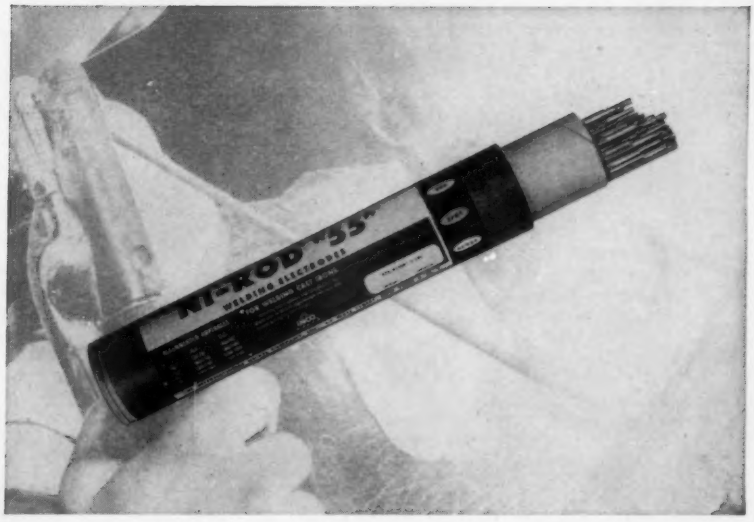
411 **Standard, Special Conveyors**—Catalog 400, 20 pp, describes standard and special conveyors for a variety of materials handling applications in industry. Photos of typical installations illustrate roller conveyors, wheel conveyors, live roller conveyors, belt conveyor, pusher bar conveyor, elevating equipment, overhead cable trolley, overhead chain trolley, special handling equipment, slat conveyor, drag chain conveyor, bulk handling equipment. The E. W. Buschman Co.

412 **Steel Conveyor Belts**—"A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. Photos and diagrams illustrate the text. The Colorado Fuel and Iron Corp.

413 **Power and Free Conveyors**—Catalog 52, 80 pp, describes important features of a power and free conveyor system and illustrates component parts. Includes data on trolleys, rivetless chain, single and compound vertical curves, switches, caterpillar drives, roller curve takeups, inspection and lubricating gates, carriers, load bars, bumpers, automatic stops and feeders, others. Dimensions and standard assemblies are shown on diagrams and typical applications pointed out. Jervis B. Webb Co.

414 **Lift Truck Work Kit**—A method of predetermining the time necessary for fork lift trucks to perform specific operations is provided in this work kit, designed to enable plant engineers to apply fork lift truck standard performance data. It can assist in determining efficiency of fork lift trucks now in use as well as in planning for future needs. Includes typical materials handling examples to show technique for application of the data, as well as charts providing times for basic truck motion elements. The Yale & Towne Mfg. Co.

415 **Electric Fork Trucks**—Two electric fork trucks designed for high maneuverability, ease of maintenance, and operator comfort and convenience are introduced in two 6-pp bulletins. Bulletin 1324 covers a 4000-lb. capacity model; Bulletin 1325, a 6000-lb. truck. Performance,



Improved NI-ROD "55" makes it even easier to weld cast iron parts!

No special training! Plant engineers have long preferred Ni-Rod "55"* electrode for welding cast iron. *And with good reason:* No special equipment is required . . . no special training. Yet even weldors of limited experience produce sound joints.

Now better yet! Today Ni-Rod "55" electrode teams up proved nickel-iron-core wire with *improved* flux coating. Result: even *easier* cast iron welding!

Handles even better! Ni-Rod "55" electrode is truly *easy*-handling. Use A.C. or D.C. You get stable arc . . . smooth bead contour . . . *easy* slag removal. You get welds that are strong and machinable.

Helpful folder — free. "Repair Cast Iron Parts Quickly and Easily" contains illustrated stories of successful welding . . . shows how Ni-Rod "55" electrode makes cast iron welding practical and profitable in *any* plant. A postcard brings your copy.

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INCO Welding Products Electrodes • Wires • Fluxes

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

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HOW THIS EMERGENCY LIGHTING UNIT CUTS MAINTENANCE COSTS

LIGHT WARDEN CHARGOMATIC 88

1. Guaranteed *5 years*—both battery and unit.
2. Eliminates manually operated charger switches and timers.
3. Eliminates undercharged and overcharged batteries, cutting maintenance costs to the minimum.
4. Eliminates meters and messy hydrometers.
5. One standard unit can support 5 heads mounted remotely as desired.
6. Needs addition of water only *once* in 6 months.
7. Completely automatic operation assures unfailing protection.

Complete engineering service available. Recommendations and quotations gladly furnished. Catalog on request.

ELECTRIC CORD COMPANY
195-C WILLIAM ST., NEW YORK 7, N. Y.

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Wide *or* Narrow...

1 C•F LIFTER HANDLES THEM ALL

Whether your production requires a few or many widths of sheet steel, one C-F Lifter, with its wide range of jaw and carrying angle adjustments will probably meet all your sheet handling requirements.

Adjustments are made by the operator in a few seconds, permitting the Lifter to shift from wide to narrow sizes almost instantly.

Because it can pick up, carry and unload more loads per hour, using less man and crane time than any other methods, a C-F Lifter will soon pay for itself.

Bulletin SL-28 gives you the complete story of C-Lifter, advantages to you. Ask for it today. There is no obligation.

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1317 South Kilbourn Avenue • Chicago 23, Illinois

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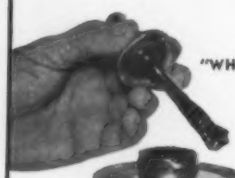
IS NOW IN HANDY

SQUIRT CANS!

A powerful blend of quick-acting, super-penetrating solvents, not to be confused with ordinary penetrating oils. Harmless to all metals. Frees parts frozen by rust, corrosion, scale, paint, varnish, carbon, or gum.



"WHEREVER PRESSURE-TIGHT CONNECTIONS ARE REQUIRED..."

TITE-SEAL

GASKET AND JOINT

SEALING COMPOUND

Heat-proof, vibration-proof, non-solvent, non-shrinking, non-crumbling, non-cracking . . . for every gasketing and sealing requirement. Makes all assemblies leak-proof and pressure-tight. Prevents rust, corrosion and seizure of joints.

2157

At Hardware, Automotive and Industrial Jobbers

RADIATOR SPECIALTY CO., Charlotte, N. C. (Dept. 2)

In Canada: Radiator Specialty Co., Ltd., Toronto

SOLDER SEAL

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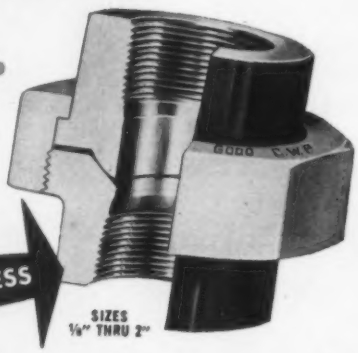
NEW petro

6000 LBS.

C.W.P.

FORGED STEEL UNIONS

Ideal for High Pressures of Gases or Liquids, Hot Oils, High Temperatures, Ammonia Hot or Cold & Power Piping



HEAVIER WALL THICKNESS

SIZES
⅛" THRU 2"

- The wall thickness of this New Petro Union has been greatly increased to easily withstand the severe demands of higher pressures and hot or cold temperatures. It is drop forged from uniformly heated steel forging bars. Grain and fibre structure are refined through the controlled hammer impact on the hot, plastic metal as it is confined in the closed dies. The hot forging develops the tensile and torsional strength, the toughness and fatigue endurance required to enable the finished Union to resist the most complex stresses and strains over present in high pressure and high temperature piping systems.
- Nuts are octagon in shape and are Udylited. The nut threads are rust-proof, spark-proof and permanently lubricated with Udylite Cadmium.
- The ends are also octagon in shape to provide flat gripping areas for wrenches.
- The ends are tapped, sharp and clean, per American Standard B 2-1 1945 (for tapered pipe threads).

THE "ECONOMY PLUS" UNION

You'll get greater ruggedness, dependability and service with a minimum of downtime or maintenance time. Considering the original low cost it's the most economical Union you will ever buy.

MAIL THIS COUPON TODAY!

PLEASE SEND US COMPLETE INFORMATION ON THE 6000 LB. PETRO

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ADDRESS_____ CITY_____ ZONE_____ STATE_____

CLAYTON MARK & COMPANY • 1900 Dempster Street • Evanston, Illinois

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DATA FILE

(Begins on page 208)

specifications, dimensions, details on controls and construction are given, features explained, and attachments shown. Baker-Raulang Co.

417 **For Heavy Moving**—How Mighty Movers solve heavy moving problems with economy, safety and speed is detailed in this illustrated folder. Lists various applications and includes specifications. Mighty Mover Co.

418 **Sheet Lifter**—Operational and design features of company's sheet lifting equipment, which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

419 **Load Handling Equipment**—Bulletin 406, 24 pp, covers company's Budgit, Tugit and Load Lifter products and other load handling specialties. Catalog numbers, sizes and specifications are tabulated, and application photos of the various products are included. Complete specifications and principal dimensions are indicated on tables. Manning, Maxwell & Moore, Inc.

420 **Oil-Hydraulic Lifts**—Catalog RE-203, 20 pp, covers the field of heavy-duty oil-hydraulic lifting devices for industrial applications. Featured in catalog are company's standard Levelator lifts, a 6000 lb single-jack model and a 12,000 lb dual-jack lift. Also featured is an electric pump mounted on an oil tank for powering oil-hydraulic devices. Illustrates lift platforms, platform accessories and safety devices, jacks, power units. Rotary Lift Co.

421 **Shock Absorbing Casters** — Twenty-pp Catalog FH-53 describes construction features of company's Floating-Hub casters, listing types and mountings now available. Load ratings for each type and size are provided. Stresses, by text and illustration, how these shock absorbing casters work, permit smooth travel over rough floors. The Bassick Co.

422 **Hydraulic Jacks, Pullers**—Bulletin Hydraulic-56, 16 pp, features company's line of hydraulic jacks and pullers. Prepared as an application guide for using various high-pressure jacking and pulling tools, it contains full descriptions, mechanical specifications and size charts, as well as illustrations of equipment in use. Templeton, Kenly & Co.

423 **Handling Baskets**—Bulletin B-54 describes company's complete line of standard and custom-engineered Eezy-Stak parts handling baskets, for machinery, washing, plating. Wire & Iron Products, Inc.

424 **Self-Dumping Hoppers**—Bulletin 250 describes self-dumping hoppers reported to cut cost of hand unloading at least 50 per cent. Details rugged construction of the units, safety catch incorporated, other features. Standard models are pictured, as are some typical jobs handled. Roura Iron Works.

FANS, VENTILATING

426 **Industrial Fans**—Propellair Bulletin 650, 12 pp, contains dimensions, application, and performance data on Tubeaxial and Stack-booster fans. Gives information on cooling and drying problems, system and open surface tank ventilation. Robbins & Myers, Inc.

427 **Standard Duty Fans**—Designs and construction details of company's line of standard duty fans are covered in 28-pp Bulletin 543. Points out advantages, shows arrangement and application, describes accessories. Tables list specifications. The New York Blower Co.

MECHANICAL POWER TRANSMISSION

429 **Roller Chains, Sprockets**—Catalog 754, 64 pp, describes, illustrates a line of roller chain stock sprockets, including minimum bore sprockets for reboring, also finished bore and Taper-lock bushed sprockets which are ready to use. Tables show speed ratios for sprocket combinations, standard keyways and setscrews. Includes chain selection and application data, installation and lubrication recommendations,

STAINLESS!

—from inlet to tip

Now the superlative Mastergauge is available in a wider range of corrosion resistant tubes and sockets than any other pressure gauge.

Check the adjoining list. And remember that tube socket and tip are fused into one piece by the exclusive Marsh "Conoweld" process.

Marsh alone combines the "Conoweld" construction, the copper-clad "Marshalloy" case, the finer Mastergauge movement, the Marsh "Recalibrator", the new "Safecase." Ask for data covering your specific needs.

SIX CHOICES
of tubes and sockets

4130 alloy steel tube with alloy steel tip and socket.

403 stainless steel tube with alloy steel tip and socket.

403 stainless steel tube with 416 stainless tip and socket.

316 stainless steel tube with alloy steel tip and socket.

316 stainless steel tube with 303 stainless tip and socket.

"K" Monel tube with alloy steel tip and socket.

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MARSH "THE STANDARD OF ACCURACY"

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5 7/16"

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AGASTAT allows you to stagger the starting of three motors without imposing their load on the line at the same time.

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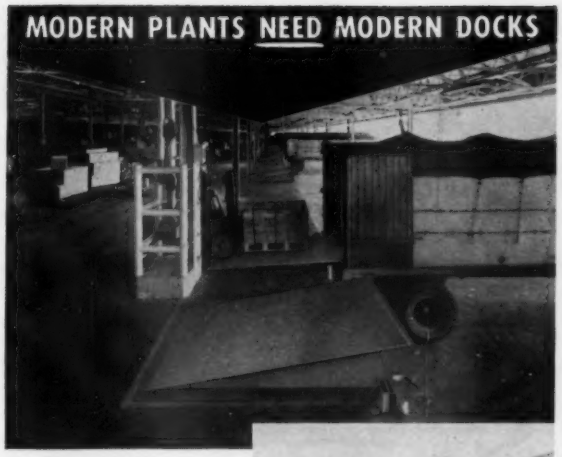

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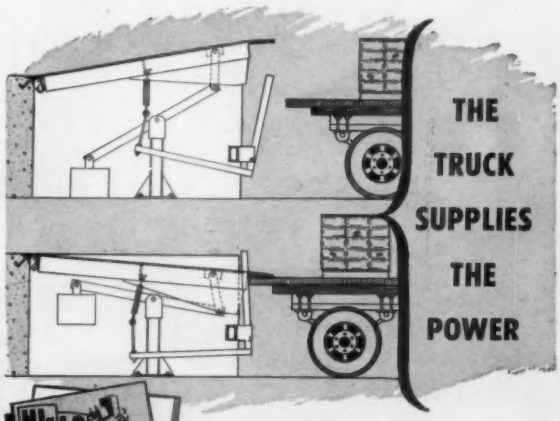

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DATA FILE

(Begins on page 208)

chain length calculations, dimensions and price lists for single and multiple strand roller chains. Diamond Chain Co.

430 **Sprockets and Chain**—Bulletin A-624 24 pp, is compiled to provide plant engineers with all data required for selecting and ordering roller chain and sprockets. Devotes a page to Taper-Lock sprockets for each size of chain from 40 to 100, giving sectional drawing, dimensions, number of teeth, maximum stock bore available, weights, prices and other data. Another page covers Taper Lock bushings; and full information is given on riveted and cotter-type roller chains. Dodge Mfg. Corp.

431 **Adjustable Speed Drives**—Bulletin PB-4700-1 describes company's packaged adjustal le speed drives—covering latest developments in design and construction. Tells how these packaged, pre-wired pre-assembled units provide flexibility of d-c motor performance from an a-c power supply, and offer simple, convenient speed adjustment without intermediate speed changing equipment or line shafting. Crocker-Wheeler Div., Elliott Co.

432 **Power Transmission Equipment**—Form 1200, 12 pp, describes a full line of conservatively rated equipment for various power transmission requirements, including flexible couplings, variable speed pulleys, variable speed belts and sheaves, variable speed transmissions, motor bases, and universal joints. Dimensional and capacity data are tabulated. Lovejoy Flexible Coupling Co.

433 **Helical Gear Drives**—A new line of in-line helical gear drives is described in 16-pp Book 2651. Load classes for over 250 applications, overhung load ratings and dimension tables, insructions for proper selection and cutaway views of both double and triple reduction drives are given. Link-Belt Co.

434 **Fluid Drive**—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation are covered in detail and selection tables are provided for direct connected and V-belt types. American Blower Corp.

435 **Flexible Couplings**—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design principles. Double-flexing and floating shaft types, light duty couplings and types for special applications are described and pictured in detail. Thomas Flexible Coupling Co.

436 **Spacer Coupling**—Of special interest to plant engineers concerned with operation of many pumps is Manual 4838 on this company's Type F Steelflex spacer coupling which has a quick-disconnect feature. Step-by-step illustrations show how to install, remove coupling and lubricate it during assembly. Process pump selections are tabulated, dimensional data included. The Falk Corp.

437 **Fluid Couplings**—Bulletin 144-D, 14-pp, presents complete installation and performance data on fluid couplings. Illustrated with diagrams and drawings, bulletin shows ease of applying company's fluid couplings on any type industrial equipment, powered by any type electric motor or internal combustion engine from 3/4 to 850 hp. Describes standard models providing standard input, output combinations, and standard models in packaged units. Installation hook-ups are given, along with typical applications. Twin Disc Clutch Co.

DUST CONTROL

439 **Dust Control**—"Engineered Efficiency in Dust Collection and Recovery," 36 pp, discusses industrial dust recovery from standpoint of nuisance abatement, waste avoidance, hazard elimination. Shows effect of variation in particle size, distribution and specific gravity of dust on efficiency of the dust collecting system. Buell Engineering Co., Inc.

440 **Dry-Type Filters**—Bulletin 600, 8 pp, describes company's Staynew ventilation and air conditioning filters. Specifications, engineering, performance and installation data covering dry type panel filters for the removal of air-borne impurities given. Dollinger Corp.

441 **Dust Filter**—Advantages offered by company's type RJ dust filter are listed in Bulletin 560. A cutaway view points out construction details and table lists capacity ratings. The Day Co.

442 **Industrial Dust Control**—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included, as well as photos, cutaway views, drawings and capacity data on the various units. Pangborn Corp.

BOILERS, GENERATORS

444 **Packaged Boilers**—This 16-pp illustrated catalog describes manufacturer's new Type VP Package boiler. Following a section of background information, is an outline of principal design features of these boilers, which are shop assembled and provide steam capacities from 4000 to 40,000 lb per hour. Space requirements are shown in a table along with specifications. Combustion Engineering, Inc.

445 **Automatic Boilers**—Bulletin BE-4 describes operation and advantages of Continental automatic boiler's spinning gas technique—a method of obtaining maximum heat transfer with a simplified design. Shows cutaway view of boiler construction; illustrates hinged doors and method of injecting air through static, turbine-like vanes into burner. Boiler Engineering & Supply Co., Inc.

446 **Package Boilers**—This 12-pp booklet on package steam generators describes the formulas behind all package steam generators, and illustrates how installation of a package steam generator can raise steam capacity in an existing boiler room without extensive structural changes. Shows plant operators how to

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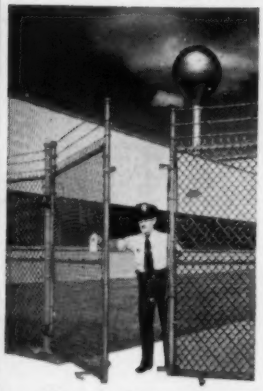

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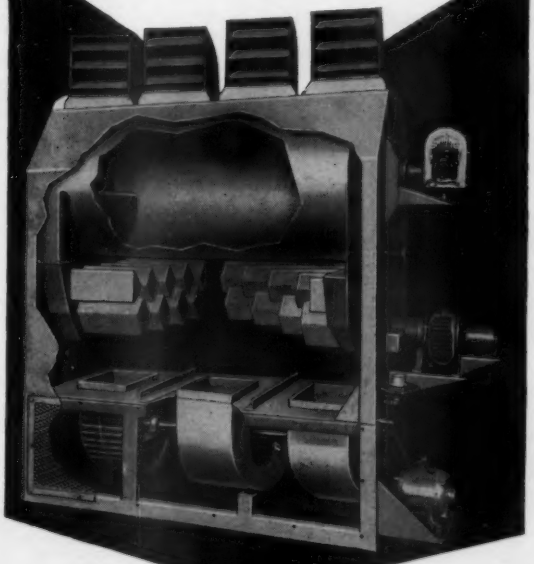

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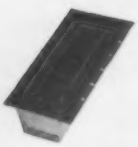

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DATA FILE

(Begins on page 208)

make survey of their own steam requirements. Cyclotherm Div., National-U. S. Radiator Corp.

447 **Automatic Boilers**—Advantages of company's packaged automatic boilers for light oil, heavy oil, gas or combination gas-oil firing are outlined in Bulletin 1220. Describes two models, and includes ratings, dimensions and weights. Orr & Sembower, Inc.

448 **Packaged Generators**—This 16-pp catalog covers a new series of packaged steam generators in sizes from 10,000 to 46,000 lb of steam per hour. Gives capacities, dimensions, construction features. Instrumentation is discussed. Illustrations include sectional drawings and installation photos. Booklet also provides a selection chart on firing equipment and controls. Foster Wheeler Corp.

PLASTICS, SYNTHETICS

450 **Super Polyethylene**—A new type of polyethylene which has greater heat resistance, greater structural stiffness, and better appearance than previous types, is the subject of 16-pp Bulletin C-5-216. Properties of the thermoplastic material are detailed, as well as uses. Chemical Div., Koppers Co., Inc.

451 **Synthetic Fluids, Lubricants** — Form F-6500D, 52 pp, on synthetics, covers properties, applications, and characteristics of these poly-alkyline-glycol derivatives. Describes uses as mechanical lubricants, hydraulic fluids, rubber and textile lubricants, heat-transfer fluids, anti-foam agents, solvents, and formulation components. Engineering data is presented in the form of tables and charts, and application photos included. Carbide and Carbon Chemicals Co., Div., Union Carbide and Carbon Corp.

452 **Solution Resins**—This folder contains a series of bulletins on solution resins, covering six Exon vinyl chloride resins for solution coatings. Outstanding characteristics of each resin are described and a graph showing the solubilities of these resins in methyl ethyl ketone is included. Solution viscosity tables, data on formulating and other information included. Chemical Sales Div., Firestone Plastics Co.

453 **Polyvinyl Chloride** — Facts about all forms of Boltaron PVC are presented in Bulletin 4B. Includes data on mechanical properties, electrical, thermal, and miscellaneous properties, and chemical resistance. H. N. Hartwell & Son, Inc.

OTHER EQUIPMENT

454 **After Cooler**—Bulletin 130, 8 pp, explains functions of company's Aero after cooler in removing moisture from compressed air and gas. The apparatus is described and illustrated with diagrams and photos. Included also are diagrams and illustrations of applications in liquefication systems. Niagara Blower Co.

455 **Detergent Oils**—How to clean sludge out of hydraulic and lubrication system without shutting down machines is told in Technical Bulletin 44. Also tells how continued use of these highly detergent oils keeps equipment as clean as new. Sun Oil Co.

456 **Equipment Selector Charts** — Bulletin CE-50, 20 pp, contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and

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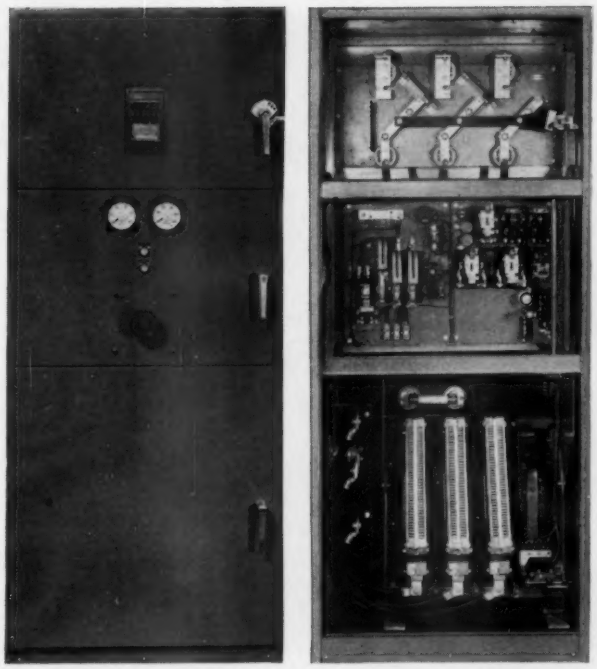

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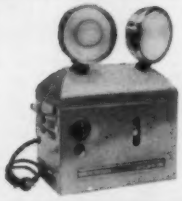

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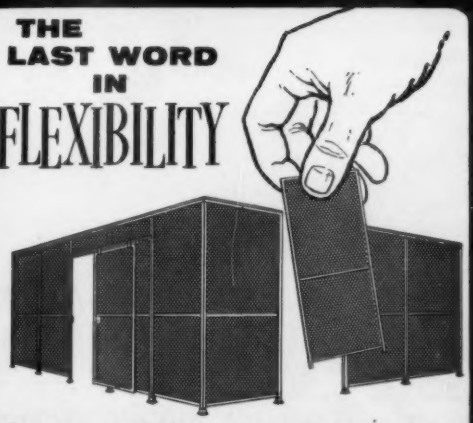

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DATA FILE

(Begins on page 208)

plastic pipe, tubing and fittings; valves; pumps; rubber-lined tanks. American Hard Rubber Co.

457 **Ductile Iron** — Cast iron that can be bent is described in this 28-pp revised edition, with tables, charts and photos. Photos show applications of ductile iron castings, and bulletin lists typical applications in various industrial fields. The International Nickel Co., Inc.

458 **Abrasion, Corrosion Protection** — This 24-pp book illustrates how company's rubber faced steel plate reduces maintenance cost resulting from abrasion or corrosion. Shows case histories in a wide variety of industries. The Gates Rubber Co.

459 **Industrial Finishing Equipment**—Catalog A-657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. Typical finishing systems handling a variety of products are pictured and details on how system can be designed to accommodate any product and meet any production requirement are furnished. The R. C. Mahon Co.

460 **Incinerators** — "The Incinerator Blue Book" is a 16-pp bulletin on incinerator developments, covering design features, methods of feeding or charging of refuse, waste analysis, and other information. An incinerator selection chart, classification of incinerators, capacity and dimension data and incinerator specifications are included. Joseph Goder, Inc.

461 **Protective Clothing**—Catalog 12000, 12 pp, describes and illustrates company's line of industrial clothing for protection against water, fire, acids and alkalis, slipping and scuffing. Various types of work gloves and suits and coats are featured, and protective features and advantages of this equipment are pointed out. The B. F. Goodrich Co.

462 **Glassed Steel Reactors** — Bulletin 927, 8 pp, describes glassed steel reactors for processing a wide variety of products under diverse conditions, stressing their versatility as to corrosion resistance, agitation, and temperature-pressure range. Standard specifications are tabulated and dimensional diagrams are included. The Pfaudler Co.

463 **Neoprene Design Book**—This illustrated bulletin discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Elastomers Div., E. I. du Pont de Nemours & Co.

464 **Hydraulic Cylinders** — Catalog 200-6, 26 pp, describes company's hydraulic cylinders for die casting, pushing, lifting, holding, pulling, tilting, clamping, pressing, turning, squeezing and other power movements in any direction. Construction features and specifications are detailed, sectional drawing showing component parts is included, as well as dimensional and mounting data. Logansport Machine Co., Inc.

465 **Magnetic Selection Guide** — Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets, serve as handy guide to selection. Dings Magnetic Separator Co.

466 **Air Conditioning Systems** — Summer and winter air conditioning systems for year-round comfort are illustrated and described in 24-pp Form L-115. Covers waterless condensing units, cooling coils, fan-coil units, water-cooled packaged air conditioners, gas and oil winter air conditioners, and individual room conditioners and other equipment. Capacity data, dimensions, and specifications are included, as well as photos and drawings. Airtemp Div., Chrysler Corp.

467 **Swivel Joints**—Catalog G-4, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products, including loading racks, manifolding lines, all-metal hose. In addition to providing dimensional and operating data on these products, this booklet is generously illustrated. Chiksan Co.

468 **Improved Machine Mounts**—This brochure describes advantages of company's leveling machine mounts. Tells how they enable installation and leveling of heavy machines without bolting or shims, afford increased machine mobility, reduce maintenance costs, and lessen noise. Barry Controls, Inc.

469 **Television Equipment** — Twenty basic applications for "TV Eye" low-cost closed circuit television equipment are described and pictured in Form 3R2335. Folder explains equipment's functions and operation, lists specifications. Radio Corp. of America.

470 **Spray Painting**—Advantages of an electrostatic spray painting process are discussed in this 16-pp bulletin which contains diagrams of both the disk atomizer and bell-shaped atomizer. Production line examples show applications in the finishing of industrial products ranging in size from automobile chassis to door knobs. Technical laboratories where a variety of conveyors are available for testing of electrostatic spray painting are also shown. Ransburg Electro-Coating Corp.

471 **Chemical Control and Testing** — The need for intelligent chemical control and testing to assure the success of a water conditioning program is described in this 6-pp pocket-sized folder. Emphasizes need for explicit control limits and chemical tests to show that these limits are being met, and the proper technical skill required to prescribe these limits. Hall Laboratories, Inc.

472 **Lubricant Data Book**—The 16-pp current edition of this company's popular Lubriplate Data Book offers practical information on lubrication of machinery. Gives product data on grease type and fluid products, hydraulic oil, compressor oil, motor oil. Suggestions on applying lubricants under normal and special conditions are provided. Several pages are devoted to lubricant recommendations for equipment used in a variety of industries—bottling plants, chemical and food processing, metalworking, iron and steel plants, textile plants, woodworking, pulp and paper machinery. Lubriplate Div., Fiske Bros. Refining Co.

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Every detail of Aurora Vertical Sump Pumps has been selected or developed with the definite purpose of achieving lasting, trouble-free and efficient operation.
Write for Bulletin 104
AURORA Always PUMPS

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THE NEW YORK AIR BRAKE COMPANY
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Here's an Easier way to handle your Blueprints!

This new, wall-type

Martin Sheet File System

enables you to work with a large number of blueprints more efficiently and neatly because each sheet hangs flat. When not in use, the sheet hangers fold flat against the wall, resulting in a minimum of storage space. A unique feature is the new spring clips which hold sheets firmly and permit quick and easy removal of sheets at any time. For complete information on how a Martin File System can solve your blueprint problems,
Write to Dept. IEN:

Units are available in 2 sizes, Model #30 at $49.50 holds sheets up to 30" wide, and Model #42 at $63.80 holds sheets up to 42" wide. Both sizes have a gray hammertone finish.

Fort Pitt Fixture Company
2058 W. Liberty Ave., Pittsburgh 26, Pa.

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NABISCO'S BIG NEW CHICAGO BAKERY chooses GARDEN CITY FANS

Every fan in the picture above is a Garden City Fan (for operating temperatures up to 600° F.)

The world's largest, most modern bakery installed 50 Garden City high-temperature fans to (1) exhaust products of combustion, (2) for zone cooling in the ovens, and (3) for return-band cooling. Producing 169 million pounds of top-quality crackers and cookies a year demands top-quality equipment. Nabisco preferred Garden City Fans because the patented air-cooled shaft prolongs the life of bearings, helps keep production rolling without interruption. Find out how Garden City can help you cut maintenance costs.

TEAR OUT THIS AD — a reminder TO WRITE FOR FREE CATALOG AND LIST OF "BLUE CHIP" USERS

GARDEN CITY FAN COMPANY
ESTABLISHED 1879

332 S. Michigan Ave.
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Representatives in Principal Cities

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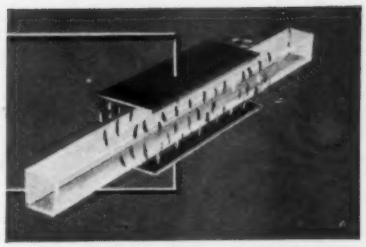

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FOR
High-Efficiency Electronic Heating

For long-term power delivery in dielectric- and induction-heating equipment, RCA offers industry an established group of electron power tubes for heavy-duty service. RCA tube design, associated with high-efficiency circuits, is your assurance of maximum power output—*around the clock*. Conservative ratings provide remarkably low tube cost per hour of equipment operation.

RCA Power Tubes are available in a wide choice of power ratings and frequency ranges. For prompt delivery on RCA power types, call your RCA Industrial Tube Distributor.

FREE TUBE GUIDE
24-page data booklet (PG-101-C) on RCA power tubes, rectifiers, thyratrons, ignitrons, magnetrons, vacuum-gauge tubes. Write RCA Commercial Engineering, Sec. B34T, Harrison, N. J.

TUBES FOR INDUSTRY
Radio Corporation of America
Tube Division Harrison, N. J.

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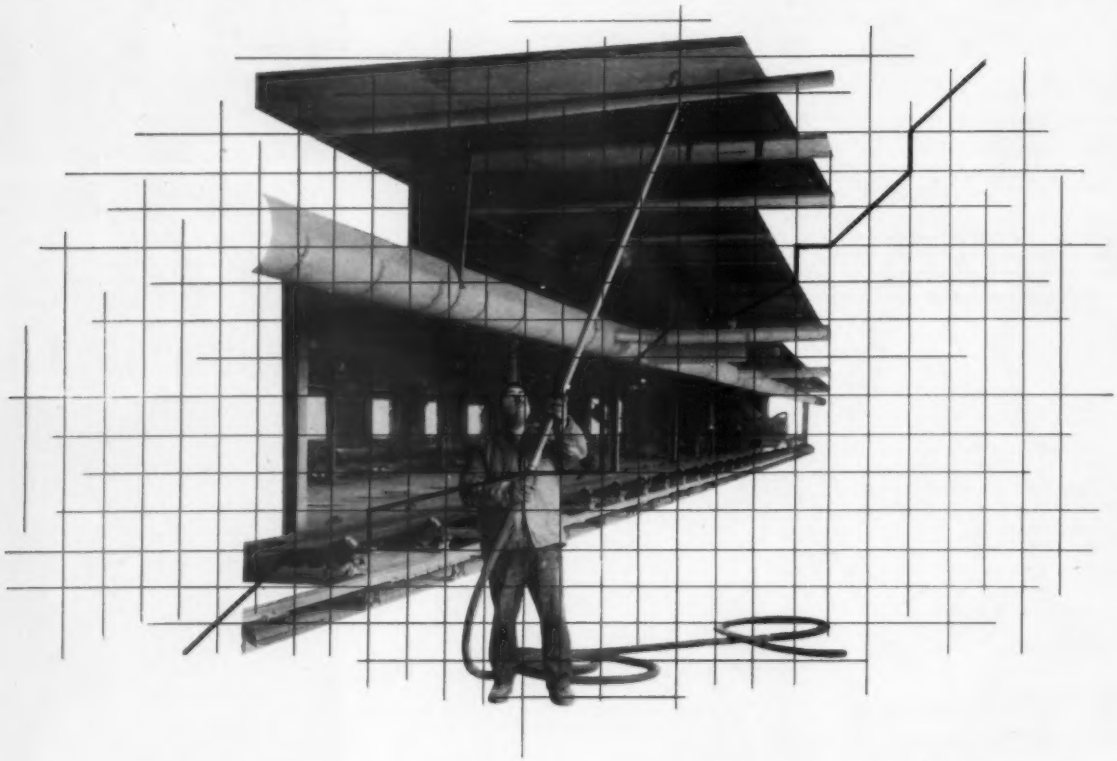
Hoffman engineered systems get **results:**



New York Port Authority finds that

HOFFMAN STATIONARY VACUUM CLEANING SYSTEM

removes dust...lowers cost...avoids danger, in its grain terminal!

And here's how: the installation of the specially designed Hoffman pneumatic system enables operators to get at **all** the grain dust: not merely on floors and lower walls, but high up, on remote ledges and along pipes. Special tools, like the goose-neck brush shown above are helping keep the terminal **thorough**-cleaned . . . to eliminate the hazard of dust explosion . . . to wipe out possible contamination points where insects could breed . . . to slice a big margin off labor costs.

If dust is hiding higher costs in **your** plant, mill or elevator, write today for a no-obligation estimate of the best way to get rid of it – for good. And get the full printed story on the New York Port Authority grain terminal, yours for free.

AIR APPLIANCE DIVISION **U.S.HOFFMAN MACHINERY CORPORATION** DEPT. PE, 103 FOURTH AVENUE, NEW YORK 3, N.Y.

AIR APPLIANCE DIVISION Multistage Centrifugal Blowers and Exhausters. Pneumatic Conveying Equipment. Industrial Vacuum Cleaning—Portable and Stationary Systems. Continuous Metal Strip Driers. "Smoothflow" Fittings and Tubing. **INDUSTRIAL FILTRATION DIVISION** Machine Tool Coolant Clarifiers—Flotation, Mechanical, and Magnetic. Lubricating and Insulating Oil Conditioners, Filters, and Vaporizers. Solvent Recovery Systems—Vacuum Stills and Filters. **ORDNANCE EQUIPMENT DIVISION** Special Pneumatic Conveying Systems, High Efficiency Centrifugal Separators. Stationary and Portable Vacuum Cleaning Equipment. Process Equipment. Pneumatic Systems for Radioactive Materials.

YOU ARE CORDIALLY INVITED TO VISIT OUR BOOTH NO. 510 AT THE PLANT MAINTENANCE SHOW

For more facts circle 696 on Reply Card

STAYNEW® FILTERS

Dollinger makes ALL TYPES of filters as shown on this page, plus special filters for unusual filtration problems. New users of one specific type of Staynew filters often find a second Dollinger filter performs a great, added service in other processes or operations. Perhaps we can serve major or other filtration needs of your plant.

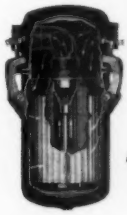
LIQUID FILTERS

Model HE (Sump)
Liquid Filter
Bulletin 330

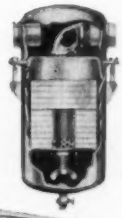
Model ELS (Pressure)
Liquid Filter
Bulletin 300

PIPE LINE FILTERS

Model CPH
Pipe Line Filter
Bulletin 200



Model CVH (Vacuum)
Pipe Line Filter
Bulletin 200



Model AAPHS
(Absorption)
Pipe Line Filter
Bulletin 200

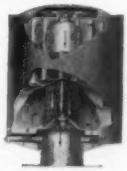
Model HPH and AHPH
(High Pressure)
Pipe Line Filter
Bulletin 200

all types of FILTERS for every INDUSTRIAL NEED

AIR INTAKE FILTERS

Model IDR
(Ground Level)
Air Intake Filter
Bulletin 100

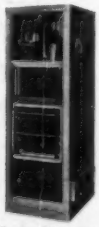
Model DS (Silencer)
Air Intake Filter
Bulletin 100



Model D (Outdoor)
Air Intake Filter
Bulletin 100

Model C (Indoor)
Air Intake Filter
Bulletin 100

VENTILATION FILTERS



Electro-Staynew
Mist Collector
Bulletin 420

Electro-Staynew
Precipitator
Bulletin 400

Automatic
Ventilation Filter
Bulletin 500

Dry and
Viscous Panel
Ventilation Filters
Bulletin 600 and 700

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION
CENTRE PK.
ROCHESTER 3, N. Y.

Write, using Bulletin Numbers, for complete information on any of the Staynew filters illustrated. Consult Dollinger engineers on any special filtration problems—no obligation. Dept. 55 Centre Park, Rochester.

LIQUID FILTERS, PIPELINE FILTERS, INTAKE FILTERS, HYDRAULIC FILTERS, ELECTROSTATIC FILTERS, DRY PANEL FILTERS, VISCOUS PANEL FILTERS, LOW PRESSURE FILTERS, HIGH PRESSURE FILTERS, AUTOMATIC VENTILATION FILTERS, NATURAL GAS FILTERS, SPECIAL DESIGN FILTERS, SILENCER FILTERS

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★ ★ ★

This Safety Switch is Built to Match the Performance of the Finest in Motor Control

☆ *installs easier*

☆ *works better*

☆ *lasts longer*

A Safety Switch Worthy of its Name
Cutler-Hammer 4105. Type A. 30 to 1200 Amp.

Engineered for "heat-proof" dependability. New design for minimum internal heat generation; new materials for heat immunity.

Automatic pressure fuse receivers; no screws to forget to tighten . . . no screws to loosen in service by alternate expansion and contraction.

Visible blades for quick and sure inspection at all times. New double insulated steel operating hook. Safety is important in safety switches.

Panel mounted mechanism of the Cutler-Hammer 4105 Safety Switch is readily interchangeable with that of the Cutler-Hammer 4101 to permit replacements without case and conduit work.

Cutler-Hammer Three-Star Motor Control performance has proved sensational wherever and whenever it has been compared with any other control equipment. A kaolin processing plant in Georgia, for example, reports: "Because of the hard service we give motor control in our plant, we have always had to replace contacts every 30 to 60 days. Our first Three-Star Control has now been in daily use for *thirteen months* and its original contacts still look and perform like new." A lumber mill in California says: "Control contacts have always been a problem on our drive of the feed chain going to the trim saw. We had to replace contacts every few weeks. Your Three-Star Control is now in its *twenty-fourth month* of continuous daily operation with the original contacts still in service."

Such control equipment brings important dependability and savings to any job. But it should be matched with a safety switch designed and built to equal the performance. That is exactly what the Cutler-Hammer 4105 Safety Switch offers. It is loaded with advanced design features. See it. Try it. Prove it. Order from nearby Cutler-Hammer Distributor today. CUTLER-HAMMER, Inc., 1447 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto.

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MOTOR CONTROL
C-H

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